U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office

Rawlins Field Office September 2004

ENVIRONMENTAL ASSESSMENT for the Atlantic Rim Interim Drilling Project, Jolly Roger Pod, Carbon County, Wyoming

MISSION STATEMENT

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BLM/WY/PL-04/035+1310

WY-030-04-EA-390

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Rawlins Field Office
P.O. Box 2407 (1300 North Third Street)
Rawlins, Wyoming 82301-2407

In Reply Refer To:
1790

September 1, 2004

Re: Environmental Assessment for the Atlantic Rim Interim Drilling Project, Jolly Roger Pod

Dear Reader:

Enclosed for your review and comment is the Environmental Assessment (EA) for Anadarko E&P Company (AEPC) and Warren E&P, Inc. (Warren), Jolly Roger Pod Exploration Project. The project is located in one of nine areas proposed for exploration drilling for the purpose of providing information for use in the preparation of the Environmental Impact Statement (EIS) for the Atlantic Rim Natural Gas Project. In order to satisfy the requirements of the national Environmental policy Act, this EA was prepared to analyze impacts associated with the exploration of natural gas resources northeast of Baggs, in Carbon County, Wyoming.

Analysis of the environmental consequences of the proposed action has led us to believe that this proposed project, with applicable mitigating measures, will not have a significant effect on the human environment. Pending the results of this public review of the EA, we will prepare a finding of no significant impact and issue a Decision Record or determine that there would be significant effects and in turn prepare an EIS.

Your comments should be as specific as possible. Comments on the alternatives presented and on the adequacy of the impact analysis will be accepted until October 1, 2004.

Comments may be submitted via regular mail to:

Larry Jackson, Project Manager
Bureau of Land Management
Rawlins Field Office
P.0. Box 2407
Rawlins, Wyoming 82301

Or they may be submitted electronically at the address shown below:

e-mail: rawlins_wymail@blm.gov

Please refer to the Jolly Roger Pod when submitting comments.

Please note that comments, including names, e-mail addresses, and street addresses of respondents, will be available for public review and disclosure at the above address during regular business hours (7:45 a.m. to 4:40 p.m.) Monday through Friday, except holidays. Individual respondents may request confidentially. If you wish to withhold your name, e-mail address, or street address from public review or from disclosure under the Freedom of Information Act, you must state this plainly at the beginning of your written comments. Such requirements will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Please retain this EA for future reference. A copy of the EA has been sent to affected government agencies and to those who responded to scoping or otherwise indicated that they wished to receive a copy of the EA. The EA may also be reviewed at the following locations:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, Wyoming 82009

Bureau of Land Management
Rawlins Field Office
1300 N. Third Street
Rawlins, Wyoming 82301

If you require additional information regarding this project, please contact Larry Jackson, Project Manager, at the address shown above or phone (307) 328-4231.

Sincerely,

Field Manager

Enclosure

ENVIRONMENTAL ASSESSMENT

ATLANTIC RIM INTERIM DRILLING PROJECT
JOLLY ROGER POD
CARBON COUNTY, WYOMING

Prepared for:
Bureau of Land Management
Wyoming State Office
Rawlins Field Office

September 2004

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ACRONYMS AND ABBREVIATIONS

ac-ft/yr	Acre-feet per year
ANC	Acid neutralizing capacity
AOI	Area of Influence
APC	Anadarko Petroleum Corporation
APCD	Air Pollution Control Division
APD	Application for Permit to Drill
AQD	Air Quality Division
AQRV	Air quality related valves
ARPA	Atlantic Rim Project Area
ASTM	American Society for Testing and Materials
AUM	Animal unit month
bbls/day	Barrels per day
BLM	Bureau of Land Management
CAAQS	Colorado Ambient Air Quality Standards
CBNG	Coalbed natural gas
CCR	Carbon County Road
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	Cubit feet per second
CO	Carbon monoxide
COA	Conditions of approval
COE	U.S. Army Corps of Engineers
dBA	A-weighted scale
dv	Deciview
EA	Environmental Assessment
EIS	Environmental impact statement
EPA	Environmental Protection Agency
eq/l	Microequivalent/liter
ESA	Endangered Species Act
FS	Forest Service
FWS	United States Fish and Wildlife Service
FY	Fiscal year
g/bhp-hr	Grams per brake horsepower per hour
g/hp-hr	Grams per horsepower-hour
GAP	Gap Analysis Program
GPS	Global Positioning System
HAP	Hazardous air pollutant
HDPE	High-density polyethylene
HWA	Hayden-Wing & Associates
IDT	Interdisciplinary Team
IMPROVE	Interagency Monitoring of Protected Visual Environments
JRPA	Jolly Roger Project Area
L2ABGh	Lacustrine, littoral, aquatic bed, intermittently exposed, diked/impounded

ACRONYMS AND ABBREVIATIONS

LAC	Level of Acceptable Change
MCF	Million cubic feet
MCFD	Cubic feet of gas per day
MDP	Master Drilling Plan
meq/L	Milliequivalents per liter
mg/L	Milligrams per liter
MGD	Million gallons per day
mi^2	Square mile
MMCFD	Million cubic feet per day
MSUP	Master Surface Use Program
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NM	Not measured
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxide
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	Ozone
PABFh	Palustrine, aquatic bed, semipermanently flooded, diked/impounded
Pb	Lead
pCi/L	Picocuries per liter
PEMA	Palustrine, emergent, temporarily flooded
PEMC	Palustrine, emergent, seasonally flooded
PEMCh	Palustrine, emergent, seasonally flooded, diked/impounded
PEMFh	Palustrine, emergent, semipermanently flooded, diked/impounded
PM_{10}	Particulates
$PM_{2.5}$	Particulates
PPP	Pollution prevention plan
PSD	Prevention of significant deterioration program
PUSCh	Palustrine, unconsolidated shore, seasonally flooded, diked/impounded
R4SBA	Riverine, intermittent, streambed, temporarily flooded
RCRA	Resource Conservation and Recovery Act
RFFA	Reasonably foreseeable future activity
RFO	Rawlins Field Office
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-way
RV	Recreational vehicle
s.u.	Standard units
SAR	Sodium adsorption ration
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
SO_2	Sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
TDS	Total dissolved solids

ACRONYMS AND ABBREVIATIONS

TEG	Tri-ethylene glycol
TPQ	Threshold planning quantity
TRI	Toxic release inventory
USDI	United States Department of the Interior
USDOT	United States Department of Transportation
USGS	United States Geological Service
UW	University of Wyoming
VOC	Volatile organic compound
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WDAI	Wyoming Department of Administration and Information
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil and Gas Conservation Commission
WOS	Wildlife Observation System
WSEO	Wyoming State Engineer Office
WTA	Wyoming Taxpayers Association
WYNDD	Wyoming Geographic Information Science Center

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

1.1.1 Description and Location

Anadarko Petroleum Corporation (APC) and Warren E & P, Inc. have submitted notification to the Bureau of Land Management (BLM) Rawlins Field Office (RFO) that they would like to explore and produce coalbed natural gas (CBNG) reserves in the 3,926.77 acre Jolly Roger Project Area (JRPA). This proposal arises from interim exploration to determine the presence and extent of CBNG within the Atlantic Rim Project Area (ARPA) for which an environmental impact statement (EIS) is being concurrently prepared by the RFO. The JRPA is located in Carbon County and is approximately 18 miles southwest of Rawlins, Wyoming (**Figure 1-1**). JRPA land ownership is a checkerboard of federal and private sections. All of the federal sections are administered by the RFO.

This project would consist of constructing, drilling, completing, testing, and operating 16 new coalbed natural gas wells, eight existing exploratory wells, two proposed deep injection wells, and one existing deep injection well to dispose of produced water from the extraction of natural gas. Ancillary facilities connected to the project include access roads, utilities, flow lines, market pipeline, and production facility. Ten of the 24 wells will be located on surface ownership land owned by the BLM and administered by the RFO.

1.2 PURPOSE AND NEED FOR ACTION

1.2.1 Purpose and Need for the Proposed Project

The purpose of the Proposed Action is to identify geologic formations in the JRPA that contain quantities of natural gas suitable for commercial extraction. This project would allow the proponent's to determine through exploration and extraction whether further development in the area is feasible. Exploration would identify the most economical drilling techniques, determine if it is feasible to de-water the coal seams to extract natural gas, and determine the produced water quantity and quality from the extraction process.

The Proposed Action would exercise the proponent's existing mineral rights within the JRPA to drill for, extract, remove, and market gas products. National mineral leasing policies recognize the statutory right of leaseholders to develop federal mineral resources to meet continuing national needs and economic demands so long as environmental and natural resource values are protected from degradation. BLM's authority to manage this program is stipulated by the Mineral Leasing Act of 1920 as amended, the Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976, the National Materials and Minerals Policy, Research and Development Act of 1980, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987.

Exploration and potential development of the JRPA represents an ongoing effort to locate new natural gas reserves and meet the growing energy demands in the United States. Natural gas represents an abundant domestic source of energy and reduces our dependence on foreign energy

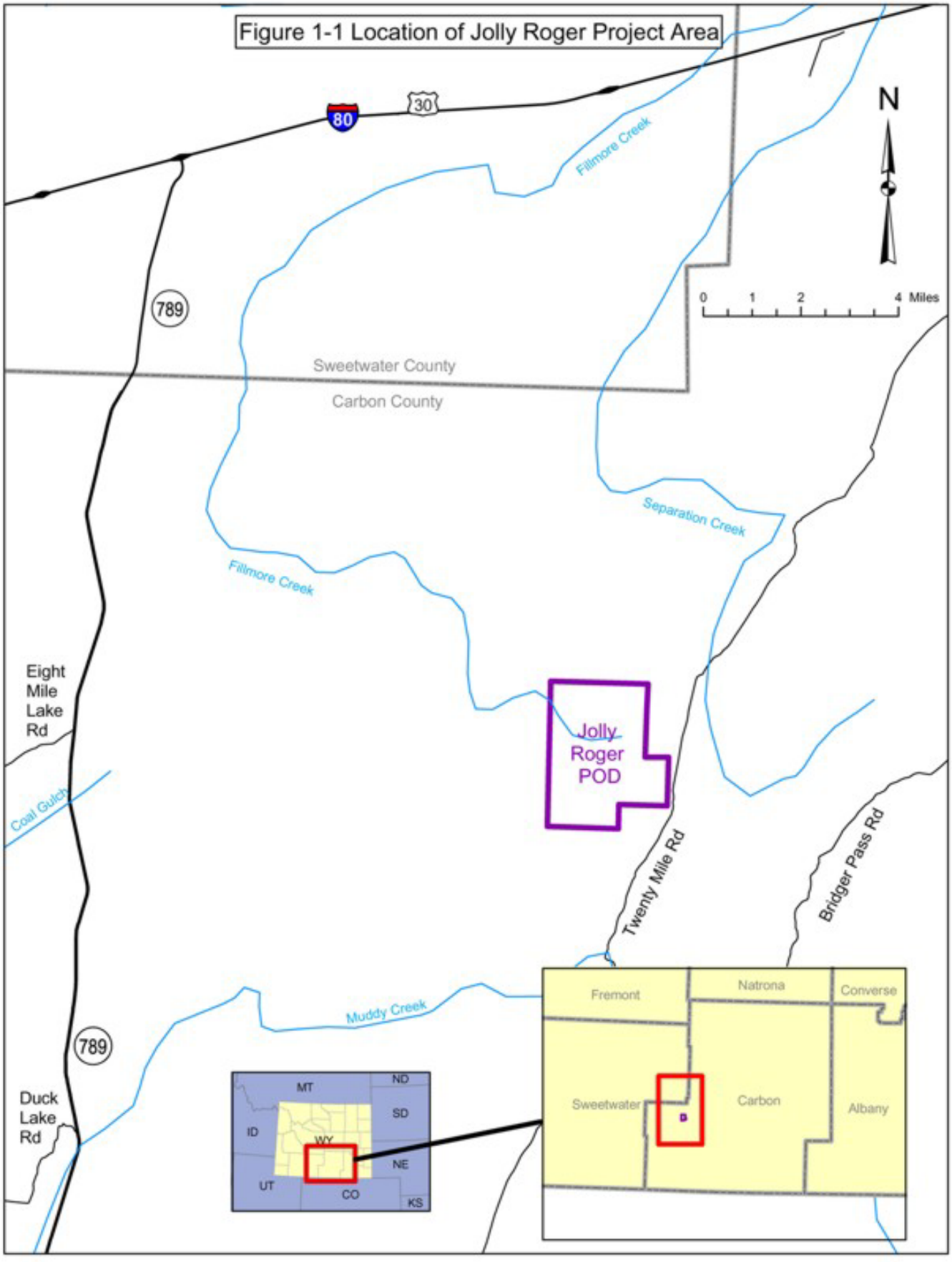


Figure 1-1 Location of Jolly Roger Project Area
80
30
789
N
0 1 2 4 Miles
Fillmore Creek
Sweetwater County
Carbon County
Separation Creek
Fillmore Creek
Eight Mile Lake Rd
Coal Gulch
Jolly Roger POD
Twenty Mile Rd
Bridger Pass Rd
Muddy Creek
789
Duck Lake Rd
MT
ND
SD
ID
WY
NE
UT
CO
KS
Fremont
Natrona
Converse
Sweetwater
Carbon
Albany

sources. In addition, utilizing natural gas reduces air emissions as compared with other sources of energy, such as coal.

1.2.2 Environmental Analysis Process

The BLM is required to prepare this environmental assessment (EA) to analyze and determine whether any significant impacts may occur in connection with the Proposed Action as stipulated in the National Environmental Policy Act (NEPA). This EA documents the analyses conducted on the proposal and alternatives in order to identify environmental effects and mitigation measures. In addition, this document is utilized for public review and comment on the Proposed Action, the environmental analysis, and mitigation measures.

Factors considered during the environmental analysis for this Proposed Action include the following:

- A determination of whether the proposal and alternatives conform to BLM policies, regulations, and the direction approved in the Great Divide Resource Management Plan (RMP).
- A determination of whether the proposal and alternatives conform to policies and regulations of other agencies that are likely to be associated with the project.
- Determination of well pad locations, access roads, pipelines, and ancillary facilities that meet resource management objectives and minimize impacts to surface resources.
- A determination of impacts on the human environment that may result from the Proposed Action, and development of mitigation measures necessary to avoid or minimize potential impacts.

1.3 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS

This EA is prepared in accordance with NEPA and complies with all applicable regulations and laws passed subsequent to the Act. In addition, the EA is prepared utilizing the stipulations and format outlined in the BLM NEPA Handbook (H-1790-1).

1.3.1 Conformance with Great Divide Resource Management Plan

The Great Divide RMP and Record of Decision (ROD) (BLM 1987, 1988a, 1990) direct management of the RFO administered lands within the JRPA. As stated in the RMP, oil and gas development on BLM administered lands consists of leasing, exploration, and development of these resources while ensuring the protection of other resource values. As stipulated in the RMP, all BLM oil and gas leases are subject to site specific conditions of approval (COAs) attached to applications for permits to drill (APDs).

1.3.2 Conformance with Interim Drilling Guidelines

The Proposed Action has been developed under the guidelines provided in the Interim Drilling Policy – "Development Authorized Concurrent with EIS Preparation for the Atlantic Rim Coalbed Natural Gas Project".

1.3.3 Relationship to Other Plans and Documents

The proposed project conforms with the State of Wyoming Land Use Plan (Wyoming State Land Use Commission 1979) and the Carbon County Land Use Plan (Pederson Planning Consultants 1997, 1998) and would comply with all relevant federal, state, and local regulations. In addition, development of this project would not affect attainment of the Wyoming Standards for Healthy Rangelands, produced in August 1977 then updated in May 2003 (BLM 2003).

1.3.4 Issues and Concerns

The following environmental, social, and management issues associated with the JRPA have been identified:

Water Resources

1. The quality of surface water in the JRPA could be affected.
2. Groundwater resources could be affected in the JRPA.

Wildlife Resources

1. Greater sage grouse leks, nesting sites, and crucial winter range may be affected by surface disturbance, vehicle traffic, and human presence.
2. Mountain Plover habitat may be affected by surface disturbance and human activities.
3. The Baggs crucial elk winter range is located east of the JRPA and it should not be affected by the Proposed Action.
4. Nesting raptors could be affected within the JRPA.

Rangeland and Livestock Grazing

1. Protection of livestock watering sources is a concern in the JRPA.
2. Protecting quality rangeland is a management concern in the JRPA.

Soil Resources

1. JRPA soils could be affected by the Proposed Action.

Cultural Resources

1. Impacts to cultural resources are a concern in the JRPA.
2. Impacts to historic trails are a concern in the JRPA.

Other Issues

1. Cumulative impacts to resources in the ARPA is an issue.
2. Impacts to air quality are an issue in the ARPA.

Mitigation

1. Use of proper best management practices during construction is required.
2. Reclamation of all disturbed areas is a management concern.
3. Surface disturbance is not recommended on slopes in excess of 25 percent.
4. All disturbed areas will be reseeded with the BLM recommended seed mixture.
5. Noxious weed infestation will be monitored on disturbed sites.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 ALTERNATIVE 1- PROPOSED ACTION

The proposed project (Alternative 1- Proposed Action) submitted jointly by Warren E & P, Inc. and APC, consists of exploration and interim development of natural gas resources on federal and fee leases in the JRPA. The proposed project location is shown in **Figure 2-1**. This Proposed Action will provide geologic and resource information to the BLM for use in the Atlantic Rim EIS. Interim drilling in the JRPA would also determine the feasibility of developing CBNG resources in the Atlantic Rim EIS study area.

The Proposed Action consists of constructing, drilling, completing, testing, operating and reclaiming 16 new exploratory wells, 8 existing wells, two proposed deep injection wells, and one existing deep injection well to dispose of produced water located on both private and federal leases. Related access roads, utilities, flowlines, pipeline, and production facilities are also planned for the Proposed Action. The location, lease number, well name, and well number of each well planned for the JRPA are shown in **Table 2-1**.

The proposed project would be located approximately 18 miles southwest of Rawlins, Wyoming, along Carbon County Road 605 (Twentymile Road), which intersects Interstate 80 (I-80) near Rawlins. The project is one of nine possible exploration areas that make up the Atlantic Rim Interim Drilling Project. Of the 24 proposed well locations, ten wells would be located on surface ownership lands administered by the BLM RFO and would develop federal minerals. The remaining 14 wells would develop fee minerals on fee surface. The compressor station and the existing injection well are located on fee lands. The other injection wells would also be located with other natural gas facilities on fee lands.

The Proposed Action is a part of the interim drilling plan associated with the Atlantic Rim EIS in Carbon County, Wyoming. The Proposed Action complies with the Interim Drilling Policy- "Development Authorized Concurrent with EIS Preparation for the Atlantic Rim Coalbed Natural Gas Project". The primary objective of interim drilling is to evaluate the following aspects of gas development in the Atlantic Rim area:

- Productivity of the coals;
- Economics of drilling and completion techniques;
- Feasibility of dewatering the coals; and
- Depths or pressure windows that may be preferred as the target for economic gas production.

In addition, the RFO must determine through a NEPA analysis that no significant or adverse impacts would occur with this development. The RFO would monitor drilling to ensure it does not significantly affect the environment or prejudice the decisions to be made as a result of the analysis conducted in the Atlantic Rim EIS.

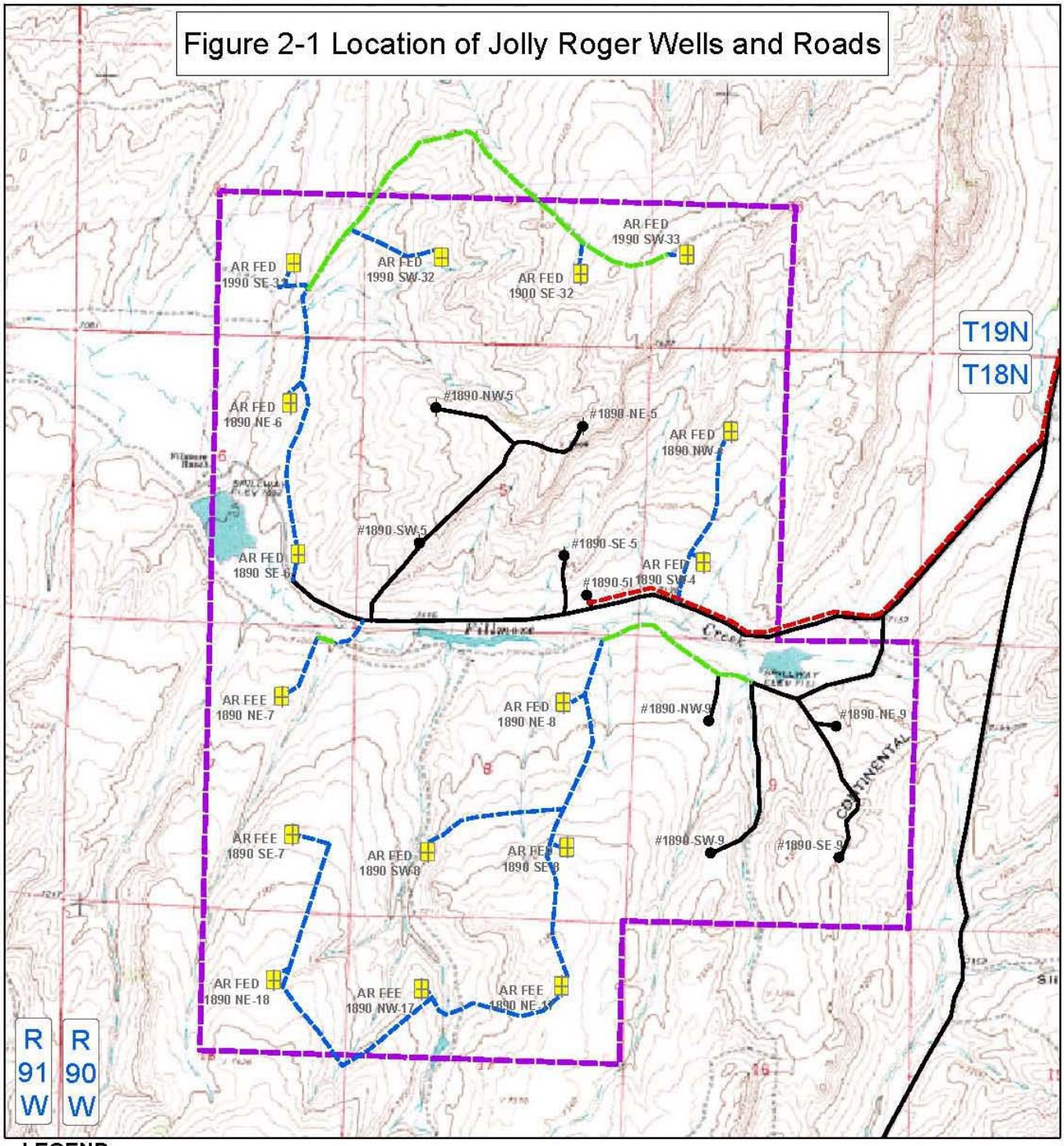


Figure 2-1 Location of Jolly Roger Wells and Roads
AR FED 1990 SW-33
AR FED 1990 SE-33
AR FED 1990 SW-32
AR FED 1900 SE-32
T19N
T18N
AR FED 1890 NE-6
#1890-NW-5
#1890-NE-5
AR FED 1890 NW-4
#1890-SW-5
#1890-SE-5
AR FED 1890 SE-6
AR FED 1890 SW-4
#1890-51
AR FEE 1890 NE-7
AR FED 1890 NE-8
#1890-NW-9
#1890-NE-9
CONTINENTAL
AR FEE 1890 SE-7
AR FED 1890 SW-8
AR FEE 1890 SE-8
#1890-SW-9
#1890-SE-9
AR FED 1890 NE-18
AR FEE 1890 NW-17
AR FEE 1890 NE-17
R 91 W
R 90 W
LEGEND
PROPOSED WELL
EXISTING WELL
SHUT IN WELL
EXISTING PIPELINE
PROPOSED PIPELINE
EXISTING ROAD NEEDS UPGRADE
PROPOSED ACCESS
EXISTING ROAD
POD #4 BOUNDARY
N
ANADARKO PETROLEUM COMPANY
POD #4 FIELD MAP
SECTIONS 4, 5, 6, 7, 8, 9, 17 & 18, T18N, R90W, 6th P.M
SECTIONS 31, 32 & 33, T19N, R90W, 6th P.M.
Scale 1" = 2500' (1:30,000)

Table 2-1
Jolly Roger Project

Proposed Wells			
Lease Number	**Well Name**	**Well Number**	**Location**
WYW-148977	AR Federal	1990-SE 32	T19N R90W Sec. 32 SE
	AR Federal	1990-SW 32	T19N R90W Sec. 32 SW
WYW-148973	AR Federal	1890-NE 6	T18N R90W Sec. 6 NE
	AR Federal	1890-SE 6	T18N R90W Sec. 6 SE
	AR Federal	1890-NW 4	T18N R90W Sec. 4 NW
	AR Federal	1890- SW 4	T18N R90W Sec. 4 SW
WYW-129066	AR Federal	1890-NE 8	T18N R90W Sec. 8 NE
	AR Federal	1890-SW 8	T18N R90W Sec. 8 SW
	AR Federal	1890-SE 8	T18N R90W Sec. 8 SE
	AR Federal	1890-NE 18	T18N R90W Sec. 18 NE
Fee Wells	AR Fee	1990- SE 31	T19N R90W Sec. 31 SE
	AR Fee	1990-SW 33	T19N R90W Sec. 33 SW
	AR Fee	1890-NE 7	T18N R90W Sec. 7 NE
	AR Fee	1890-SE 7	T18N R90W Sec. 7 SE
	AR Fee	1890-NW 17	T18N R90W Sec. 17 NW
	AR Fee	1890-NE 17	T18N R90W Sec. 17 NE
Proposed Deep Injection Wells			
Lease Number	**Well Name**	**Well Number**	**Location**
Fee Lease	AR Fee	1890-7I	T18N R90W Sec.7 SE
	AR Fee	1990-31I	T19N R90W Sec. 31 SE
Existing Deep Injection Well			
Lease Number	**Well Name**	**Well Number**	**Location**
Fee Lease	AR Fee	1890- 5I	T18N R90W Sec. 5 SE
Existing Wells			
Lease Number	**Well Name**	**Well Number**	**Location**
Fee Lease	AR Fee	1890-NW 5	T18N R90W Sec. 5 NW
	AR Fee	1890-NE 5	T18N R90W Sec. 5 NE
	AR Fee	1890-SW 5	T18N R90W Sec. 5 SW
	AR Fee	1890-SE 5	T18N R90W Sec. 5 SE
	AR Fee	1890-NW 9	T18N R90W Sec. 9 NW
	AR Fee	1890-NE 9	T18N R90W Sec. 9 NE
	AR Fee	1890-SW 9	T18N R90W Sec. 9 SW
	AR Fee	1890-SE 9	T18N R90W Sec. 9 SE

The Wyoming Oil and Gas Conservation Commission (WOGCC) established an 80-acre well spacing pattern for wells completed in the Mesaverde Group in the JRPA. Spacing for this area was established under Cause No.1, Order No. 1, Docket Nos. 157-2001 and 113-2002.

Interim drilling within the JRPA would develop over a 6-to 12-month period. Wells would be tested when completed; however; an estimated 6 to 12 months of continuous producing status in the JRPA would be needed to fully evaluate the economics of any additional development. The life of the project is estimated at between 10 and 20 years. The productive life of a gas well completed in Mesaverde Group coals is estimated to be 15 years.

Specific components of the project are shown in the Master Surface Use Plan (MSUP) (Appendix A), Master Drilling Plan (MDP) (Appendix B), and the project map (Figure 2-1). Project plans are summarized below in the section titled "Plan of Development." Although the entire project is described in the Plan of Development, the proposed federal action is limited to the anticipated activities that would require a decision or authorization from BLM to proceed.

2.1.1 Plan of Development

The proponents would follow the procedures outlined below to gain approval for the activities proposed on BLM-administered lands within the JRPA. Development also would be approved, as required, by other agencies.

2.1.2 Preconstruction Planning and Site Layout

The Proponents have submitted a federal APD and a Right-of-way (ROW) application, along with a MSUP, MDP, and a project map to the RFO that shows the specific location of the proposed activity (such as individual drill sites, pipeline corridors, access roads, or other facilities). The application includes site-specific plans that describe the proposed development (drilling plans with casing/cementing program; surface use programs with construction details for roads and drill pads; and site-specific reclamation plans). Approval of all planned operations has been obtained in accordance with the applicable regulations and Onshore Oil and Gas Order No. 1 (Approval of Operations on Onshore Federal and Indian Oil and Gas Leases). Stormwater discharges during construction would be managed in accordance with a stormwater permit issued by Wyoming Department of Environmental Quality (WDEQ).

The proposed facilities have been staked by the Proponents and inspected by an interdisciplinary team or an official from the BLM to verify consistency with the approved RMP, the Interim Drilling Policy, and stipulations contained in the oil and gas leases.

The Proponents have submitted detailed descriptions of the proposed activity and construction plans to the BLM for the proposed development. The plans address concerns related to construction standards, required mitigation, and other issues. These plans are negotiated between the Proponents and the BLM, if necessary to resolve differences, based on findings of the field inspection and take place either during or after the BLM onsite inspection.

The Proponents or their contractors revise the MSUP and MDP, as needed, based on changes agreed to with the BLM. The BLM in turn adds conditions of approval (COAs), than completes a project-specific environmental analysis that incorporates standards for construction, mitigation and COAs. If the proposal meets BLM requirements and poses no significant impacts, BLM approves the specific proposal. The Proponents must then commence the approved activity within 1 year.

A general discussion of proposed construction techniques to be used for the project is described in the following sections. These construction techniques apply to drill sites, pipelines, and access roads within the JRPA, and may vary among well sites.

2.1.3 Construction Phase

2.1.3.1 Construction of Access Roads

The JRPA is accessible from Rawlins, Wyoming, by traveling south on Carbon County 605 (Twentymile Road). In Section 3, T18N R90W, County Road 605 is intersected by the Fillmore Ranch Road, which runs southwest for approximately .75 miles and then west for approximately 1 mile. This road provides access into the JRPA. Local roads are shown on the enclosed map of the JRPA.

All existing and proposed access roads would be constructed to minimum standards for a BLM Resource Road, as outlined in BLM Manual 9113. The operator proposes to upgrade and construct 40,180 feet of new road to access all the pad facilities. The travel-way would have a running surface of approximately 14 feet wide except for turnouts, and disturbed width would be between 40-50 feet. This construction would result in approximately 46 acres of surface disturbance.

Maintenance of the roads used to access the well locations will continue until final abandonment and reclamation of the well locations occur. A regular maintenance program will include, but is not limited to, blading, ditching, culvert installation and cleanout, invasive weed control, and gravel surfacing where excessive rutting or erosion may occur.

Drainage crossings on the access routes will be low water crossings or culverts. The Fillmore Creek crossing will be designed as a low water crossing. Low water crossings are used in shallow channels. Main channel crossings consist of excavating an area approximately 4 feet deep, or deeper if specified by BLM, under the travelway and filling it with rock and gravel to the level of the drainage bottom. Channel banks on either side of these crossings would be cut down to reduce grade where necessary. Culverts (a minimum of 18 inches in diameter) would be installed on smaller, steeper channel crossings. Rip-rap will be added at the outlet of each culvert to minimize erosion. Additional culverts would be added as the need arises or as directed by the BLM's Authorized Officer.

2.1.3.2 Well Pad Design and Construction

Information on each federal well is contained in the BLM APD Form 3160-3, Well Survey Plat, and Well Pad Cross Section on file with the BLM. At each well location, surface disturbance will be kept to a minimum. The areal extent of each well pad is approximately 220 feet by 320 feet. This pad will include the reserve pit, area for temporarily storing top soil, and the cut and fill slopes. Each well pad will be leveled using cut and fill construction techniques where needed. Prior to constructing the well pad the top 6 to 8 inches of soil (more if available) and associated vegetative material will be removed and stockpiled. Drainage ditches will be constructed to divert stormwater away from each pad. Total well pad (24 wells) disturbance for the life of the project is approximately six acres, with the ten wells proposed on federal land disturbing approximately 2 acres.

The Proponents plan to use one reserve pit at each drilling location (30 feet wide and 75 feet long). This pit will be designed and constructed according to WOGCC and BLM requirements. The reserve pit will be open for an estimated 2 to 8 weeks to allow for evaporation of pit fluids. During this time the pit will be closed off from wildlife and livestock by two strands of barbed wire above a woven wire fence.

2.1.4 Drilling and Completion Operations

A conventional drilling rig would be used to drill the gas wells. Additional equipment and materials needed for drilling operations would be trucked to the drill location.

Water for use in drilling the wells would be obtained from existing wells completed in the coal seams of the Mesaverde Group. Approximately 700 barrels of water (almost 30,000 gallons) would be needed to drill each well. The actual volume of water used in drilling operations would depend on the depth of the well and any losses that might occur during drilling. The proposed project would require almost 70,000 gallons of water per well for preparation of cement and stimulation of the well (14,000 gallons) and control of dust (55,440 gallons). In all, nearly 100,000 gallons (about 0.3 acre-feet) of water per well would be used. Dust abatement using produced water would comply with all applicable WOGCC, WDEQ, and BLM requirements. Only water suitable for livestock use would be used for dust abatement. Only disturbed areas will be sprayed.

No oil or other oil-based drilling additives, chromim/metals-based muds, or saline muds will be used during drilling of these wells. Only fresh water, biodegradable polymer soap, bentonite clay, and non-toxic additives will be used in the mud system. Details regarding the mud program are incorporated within the MDP. These wells will not produce oil or salt water typical of oil production. Furthermore, other liquid hydrocarbons are not anticipated. Should unexpected liquid petroleum hydrocarbons (crude oil or condensate) be encountered during drilling or well testing, it will be contained in test tanks on the well site.

Depending on the location of the coal seam, each producing well would be drilled to an approximate depth of 1,952 feet to 5,900 feet. Natural gas in the coal seam would be produced through perforations in the casing. The well control system would be designed to meet the conditions likely to be encountered in the hole and would conform to BLM and State of Wyoming requirements.

A mobile completion rig similar to the drill rig may be transported to the well site and used to complete each well. Completion operations are expected to average 2 to 5 days per well. When the applicable permits are received, natural gas may be vented or flared, and water may be temporarily contained in the reserve pit or trucked to an alternative disposal site during the testing period. Wells determined to be productive would be shut in until pipelines and other production facilities are constructed.

The injection wells would be drilled with the same equipment and personnel used for the gas wells. Depth of the injection wells, which would be completed for the Cherokee or Deep Creek Sands, is expected to be between 3,800 and 4,600 feet. Drilling and completing each injection

well would require approximately 7 to 14 days; installing surface equipment, holding tanks, and pumping equipment may require an additional 14 days. The injection wells will be constructed on fee land and constructed on pads designed for CBNG wells (located adjacent to wells). This would result in 2 acres of disturbance for the life of the project.

2.1.5 Production Operations

In the ARPA, the wells are expected to produce 800,000 cubic feet of gas per day (MCFD) and between 200 to 500 barrels of water per well each day. The gas will be transported from the well by a pipeline to the compressor station. The water would be piped to a storage tank near the injection well. It would be stored in the tank and disposed via injection in the well. All produced water would be managed per onshore Order #7.

2.1.5.1 Well Production Facilities

Wellhead facilities would be installed if the wells are productive. Natural gas and produced water would be collected and transported from the wellhead via buried pipelines. Gas and water would be measured as specified elsewhere in the MSUP. Additionally, a vertical separator at some well sites would separate gas from the water stream.

The long-term surface disturbance at the location of each productive well would encompass approximately 0.25 acres, including cut and fill slopes. Typically, only the production facilities at the well site would be fenced or otherwise removed from existing uses. A loop road or a small, graveled pad area would provide a safe turnaround area for vehicles. **Figure 2-2** shows a typical CBNG well and pad before reclamation is complete.

Figure 2-2
CBNG Well and Pad

2.1.5.2 Power Generation

Electricity would be used to power pumps during well development and to initiate and maintain production. A centrally located electrical generator located at the compressor station will be

utilized to provide electricity to the wells. The distribution system will consist of utility lines buried in the road ROW. These lines would be installed in trenches approximately 3 feet deep.

2.1.5.3 Summary of Pipelines and Related Facilities

Construction and installation of the gas delivery pipeline occurs after the productivity of the wells has been confirmed. Pipeline corridors would be reclaimed as soon as practical after construction of the pipeline is complete. Three types of pipelines would be constructed as part of the proposed project:

1. A gas-gathering pipeline system (low pressure) would be constructed from the wellheads to the compressor station. This system would use high-density polyethylene (HDPE) pipe, starting with 4-inch diameter pipe at the wellhead and graduating up to 20-inch diameter pipe at the inlet to the compressor.

2. A produced water-gathering pipeline system (low pressure) would be constructed from the wellheads to the centralized facilities for injection. This network of water lines would use 4-inch lines from the well and graduating up to 20-inch diameter pipe at the injection well.

3. Should market quantities of natural gas be discovered, a gas delivery pipeline (high pressure) would be constructed (**Figure 2-3**). This pipeline would be constructed of 8-inch diameter steel pipe.

Gathering Systems and Utilities

The gathering systems and utility lines will parallel access roads. They will be located in separate trenches and run parallel to each other close to the road ROW. A working space for installation of these facilities will also be designated within the road.

Trenches will be excavated to install the pipelines and electrical lines. Trenching will occur as close to the road prism as feasible. Trenches excavated for well gathering lines and electrical lines (which would require a disturbed width of 20 feet for gas lines and water lines on one side of the road, and 10 feet in width for electrical lines, which are located on the other side of the road) would be reclaimed as soon as practical after trenching and backfilling are complete.

Facilities for Injection

Produced water from individual wells would be gathered and routed to central storage facilities located next to the injection wells. Produced water-gathering pipelines would be constructed along the well access road, from the wellhead to the injection facilities.

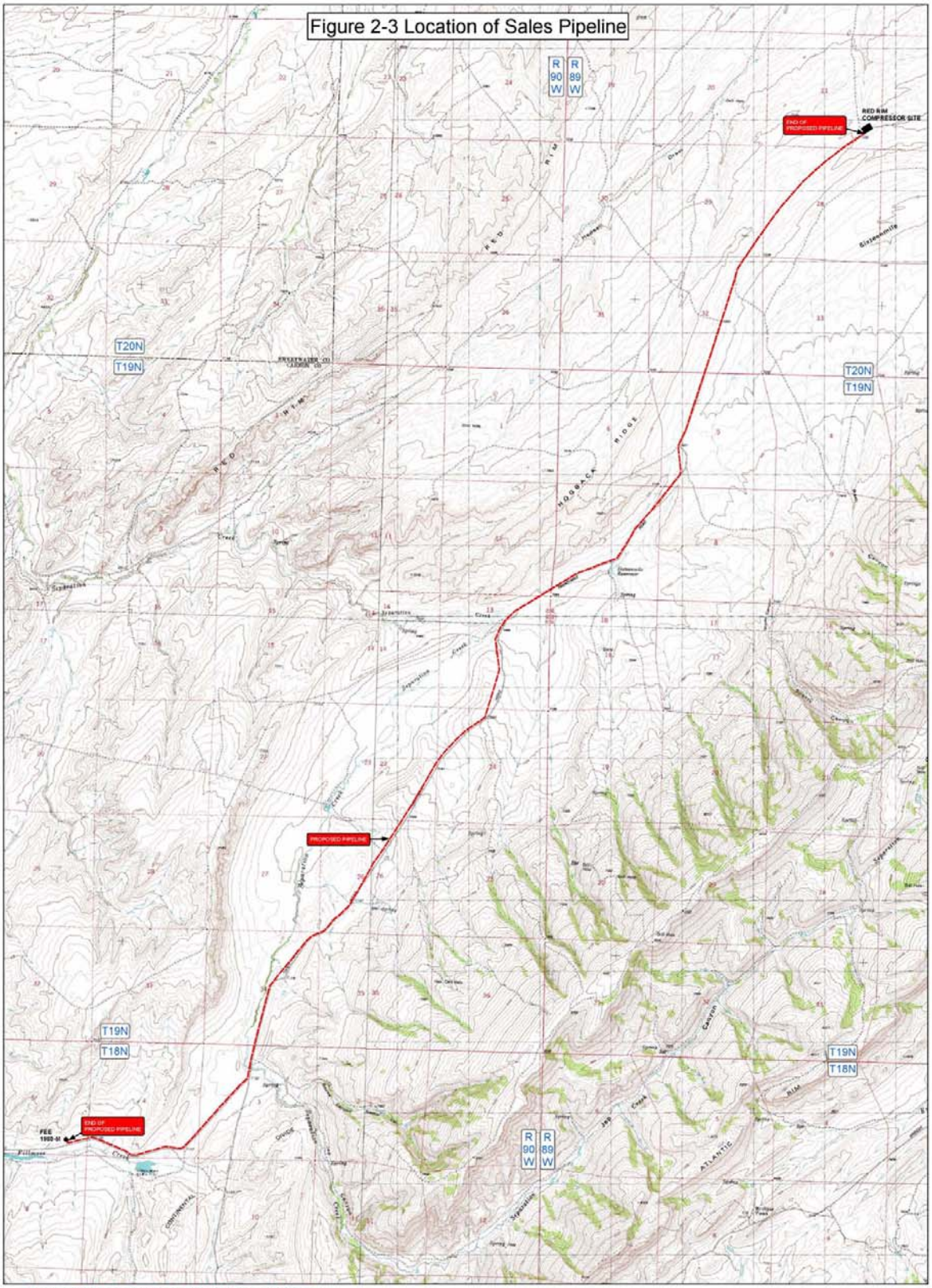
The deep injection wells would be approved by the BLM, WOGCC, and WDEQ and would be located in Sections 5 and 7 of T18N R90W and Section 31 of T19N R90W.

The approximate maximum injection capacity of the three injection wells would be 45,000 barrels per day (bbls/day).

Gas-Delivery Pipeline and Compression

The compressor station facility is expected to be located with the AR Fee 1890-5I injection well within a site area covering approximately 400 feet by 400 feet. This facility will disturb 3.7 acres for the life of the project. The compressor would be sized to handle 5 million cubic feet per day (MMCFD) from 15 pounds per square inch (psi) suction pressure to 1,200 psi discharge pressure. The compressor would be driven by a natural gas powered engine and would be designed to meet all specifications established by the WDEQ, Air Quality Division. Engines used to drive compressors would have emissions of less than 1.5 grams per brake horsepower per hour (g/bhp-hr), or less than 16.7 tons per year of nitrogen oxides (NO_x) and 0.5 g/bhp-hr, or less than 5.6 tons per year of carbon monoxide (CO). Additional equipment at the compressor station would include a tri-ethylene glycol (TEG)

Figure 2-3 Location of Sales Pipeline



APPROXIMATE PIPELINE DISTANCE : 65,200' +/-

Scale 1" = 2000' (1:24,000)

ANADARKO PETROLEUM CORP.

PROPOSED PIPELINE TO RED RIM COMPRESSOR

N

LEGEND

- COMPRESSOR SITE
- SHUT IN WELL
- PROPOSED PIPELINE

T18N, T19N, R90W, 6th P.M.
T19N, T20N, R89W, 6th P.M.

dehydration system, which would dry the gas to meet pipeline-quality specifications of the market pipeline. **Figure 2-4** shows a typical CBNG compressor station.

Figure 2-4
CBNG Compressor Station

Should market quantities of natural gas be discovered, a gas delivery pipeline would be required to move the gas to an existing system. The alignment of the delivery line from the compressor station to the existing transmission pipeline is shown on Figure 2-3. The pipeline ROW will be 50 feet wide. This pipeline would begin at the compressor station in Section 5 of T18N R90W and would proceed northeast to the existing pipeline in Section 21 of T20N R89W. The ROW would parallel County Road 605.

Construction and installation of this delivery pipeline would temporarily disturb a 50-foot wide corridor, which will be reclaimed as soon as practical after construction is completed. All construction activities would take place within the 50-foot corridor. This area would be used to transport machinery, personnel, and equipment along the corridor to install the pipeline.

Excavated top soil material will be stockpiled to the side and segregated. Top soil material will not be mixed or covered with subsurface material. After construction, cut and fill slopes would be waterbarred or regraded to conform to the topography, and reclaimed to pre-disturbance appearance.

In order to minimize surface disturbance, the operator will use wheel trenchers (ditchers) or ditch witches, where possible, to construct all pipeline trenches associated with this project. Track hoes or other equipment will be used where topographic or other factors require their use. Trenches of 5,000 feet or more in length that are open for the installation of pipelines will have plugs placed to allow livestock and wildlife to cross the trench. Placement of plugs will be determined in consultation with the BLM and the affected landowner. The new gathering lines would temporarily disturb 30.95 acres and the new market pipeline would temporarily disturb 74.8 acres. These disturbances would be reclaimed to BLM specifications.

2.1.6 Maintenance

The Proponents would operate all wells, pipelines, and ancillary production facilities in a safe manner, as set forth by standard industry operating guidelines and procedures. Routine maintenance of producing wells would be necessary to maximize performance, and detect potential difficulties with gas production operations. Each well location would be visited several times per week to ensure that operations are proceeding in an efficient and safe manner. The visits would include checking separators, water meters, valves, fittings, and onsite storage of produced water and condensates. The equipment onsite also would be routinely maintained, as necessary. Additionally, all roads and well locations would be regularly inspected and maintained to minimize erosion and assure safe operating conditions.

2.1.7 Estimates of Traffic and Work Force

Estimated traffic requirements for drilling, completion, and field development operations are shown on **Table 2-2**. The "Trip Type" column lists the various service and supply vehicles that would travel to and from the well sites and production facilities. The "Round-Trip Frequency" column lists the number of trips, both external (to and from the JRPA) and internal (within the JRPA). The figures provided on Table 2-2 should be considered general estimates. The level of drilling and production activity may vary over time in response to weather and other factors.

2.1.8 Site Restoration and Abandonment

The Proponents would completely reclaim all disturbed areas that are not needed for production through utilizing the following procedures:

Short-Term (Temporary) Reclamation

- Immediately stabilize the disturbed area by mulching, providing run-off and erosion control, and through establishment of new vegetation.
- Control and minimize surface runoff, erosion, and sedimentation through use of diversion and treatment structures.

Long-Term Reclamation

- Restore primary productivity of site and establish vegetation that provides for natural plant and community succession.
- Establish a vigorous stand of desirable native plant species resistant to the invasion of noxious or undesirable species.
- In the long-term, reclaimed landscapes should have characteristics that approximate the original visual qualities of the area.

Table 2-2
Traffic Estimates

Trip Type	Round-Trip Frequency	
Drilling (2 rigs, 2 crews/rig)	**External (to/from JRPA)**	**Internal (within JRPA)**
Rig crews	4/day	Same
Engineers [a]	2/week	1/day/rig
Mechanics	4/week	Same
Supply delivery [b]	1/week	2-4/day
Water truck [c]	1/month	2 round trips/day
Fuel trucks	2 round trips/well	Same
Mud trucks [d]	1/week	2/day
Rig move [e]	8 trucks/well	8 trucks/well
Drill bit/tool delivery	1 every 2 weeks	Same
Completion		
Small rig/crew	1/day	Same
Cement crew	2 trips/well	Same
Consultant	1/day	Same
Well loggers	3 trips/well	Same
Gathering systems	2/day	Same
Power systems	2/day	Same
Compressor stations	2/day	Same
Other field development	2/day	Same
Testing and operations	2/day	Same

Notes:

a) Engineers travel to JRPA weekly and stay in a mobile home at the JRPA during the week.
b) Current plans are to establish a central supply area within the JRPA and deliver supplies weekly.
c) Water trucks would deliver water to rigs from a location within the JRPA.
d) Current plans are to establish a central mud location within the JRPA and deliver mud weekly.
e) Four trucks would be required to move each rig to the JRPA. When drilling is complete in a JRPA, each rig would move to the next JRPA.

Performance Standards

The following performance standards should be used to determine the attainment of successful revegetation and reclamation:

- All disturbed areas should have at least 50 percent cover of protective material within six months after reclamation.
- By the second year, at least 50 percent vegetative cover should have been established.
- By the fifth year at least 80 percent of the site should be vegetated.
- Ninety percent of the revegetation consists of species included in the seed mix and/or occurs in the surrounding natural vegetation.

- Erosion condition of the reclaimed areas is equal to or in better condition than the adjacent undisturbed area.

2.1.9 Summary of Estimated Disturbances

Table 2-3 summarizes the estimated disturbances from implementing the project.

Table 2-3
Estimates of Disturbed Areas - Jolly Roger Project Area

	Evaluation Phase				Operations
Facility	Length (feet)	Width (feet)	Area, ea. (acres)	Temporary Acres	Life of Project Acres
New Roads	40,180	50	46	N/A	46
New Gathering Lines	44,950	30	N/A	30.95	0
New Market Access Line	65,200	50	N/A	74.8	0
New Drill Pads (16)	N/A	N/A	1.4	22.4	4.0
New Injection Wells(2)	N/A	N/A	1.0	2.0	2.0
Existing Drill Pad (8)	N/A	N/A	1.4	11.2	2.0
Compressor Station and Existing Injection Well	N/A	N/A	3.7	3.7	3.7
Total Disturbance				145.05	57.7

2.1.10 Project-Wide Mitigation Measures and Procedures

For this project, the Proponents have voluntarily agreed to use and comply with measures and procedures to avoid or mitigate impacts to resources or other land uses. These measures and procedures will be referred to as Best Management Practices (BMPs) throughout this document. These mitigation measures and procedures will also be applied on privately owned surface.

2.1.10.1 Preconstruction Planning, Design, and Compliance Measures

1. The Proponents would designate a qualified representative to serve as compliance coordinator. This person will be responsible for ensuring that all requirements of the APD and Plan of Development (MSUP, MDP, and Conditions of Approval) are followed.
2. New roads would be constructed and existing roads maintained in the JRPA in accordance with standards in BLM Manual 9113 for resource roads and construction details outlined in the MSUP and Conditions of Approval.
3. Roads would be crowned with a 0.3- to 0.5-foot crown, and ditched. The topsoil would be graded over the cut slope so no berm is left at the top of the cut slope.
4. Culverts would be covered with a minimum of 12 inches of fill or one-half the diameter of the pipe, whichever is greater. The inlet and outlet will be set flush with existing ground and lined up in the center of the draw. Before the area is backfilled, the bottom of the pipe will be bedded on stable ground that does not contain expansive or clay soils, protruding rocks that would damage the pipe, or unevenly sized material that would not form a good seat for the pipe. The site would be backfilled with unfrozen material and rocks no larger than 2 inches in diameter. Care would be exercised to thoroughly compact the backfill under the

haunches of the conduit. The backfill would be brought up evenly in 6-inch layers on both sides of the conduit.

5. Additional culverts would be installed in the existing access road as needed or as directed by BLM.
6. The access road would be surfaced with an appropriate grade of aggregate or gravel to a depth of 4 inches before the drilling equipment or rig is moved onto the pad.
7. The access roads would be maintained in a safe and usable condition. A regular maintenance program would include, but is not limited to, blading, ditching, installing or cleaning culverts, and surfacing.
8. If snow must be removed outside new and existing roadways, snow removal equipment would be equipped with shoes to raise the blade off the ground surface. If the surface of the ground were uneven, special precautions would be undertaken to prevent the equipment from destroying vegetation.
9. Wing ditches would be constructed, as necessary, to divert water from road ditches.

2.1.10.2 Resource-Specific Requirements

The Proponents propose to implement the following resource-specific mitigation measures, procedures, and BLM management requirements on public lands.

Geology, Minerals, and Paleontology

Mitigation measures presented in the sections of this EA on soils and water resources would avoid or minimize many of the potential impacts to surface mineral resources. BLM and WOGCC policies on casing and cementing would protect subsurface mineral resources from adverse impacts.

Scientifically significant paleontological resources that may occur in the JRPA have been protected through the following mitigation measures:

1. Project personnel would make contingency plans for the accidental discovery of significant fossils. If construction personnel discover fossils during implementation of the project, the BLM would be notified immediately. If the fossils could be adversely affected, construction would be redirected until a qualified paleontologist had assessed the importance of the uncovered fossils, the extent of the fossiliferous deposits, and had implemented recommendations for further mitigation.
2. No specific data currently exists on deposits of high or undetermined paleontologic potential in JRPA. For that reason, field survey for paleontologic resources would be conducted on a case-by-case basis. These resources would be surveyed in areas where surface exposures of the Browns Park, Green River, or Wasatch Formations occur. Field surveys may result in identification of additional mitigation measures to reduce adverse impacts to fossil resources. This mitigation may include collection of additional data or representative samples of fossil material, monitoring excavation, or avoidance. In some cases, no action beyond measures taken during the field survey may be necessary.

A report would be submitted to the BLM after each field survey is complete. The report will describe in detail the results of the survey, with a list of fossils collected, if any, and may recommend additional mitigation measures. If significant fossils are collected, the report must document the curation of specimens into the collection of an acceptable museum repository and must contain appropriate geologic records for the specimens.

Air Quality

1. All activities conducted or authorized by BLM must comply with local, state, tribal, and federal air quality regulations and standards. The proponents would adhere to all applicable ambient air quality standards, permit requirements (including preconstruction, testing, and operating permits), standards for motorized equipment, and other regulations, as required by the State of Wyoming, WDEQ, Air Quality Division (AQD).
2. The proponents would not allow garbage or refuse to be burned at well locations or other facilities. Before any wells are vented or flared, WDEQ-AQD would be notified as required by Wyoming Air Quality Standards and Regulations, Chapter 1, Section 5 Reporting Guidelines for Well Flaring and Venting. Test periods longer than 15 days would require authorization by WOGCC, in accordance with Chapter 3, Section 40 Authorization for Flaring and Venting of Gas.
3. On federal land, the proponents would immediately abate fugitive dust (by application of water, chemical dust suppressants, or other measures) when air quality is impaired, soil is lost, or safety concerns are identified by the BLM or the WDEQ-AQD. These concerns include, but are not limited to, actions that exceed applicable air quality standards. BLM would approve the control measure, location, and application rates. If watering is the approved control measure, the operator must obtain the water from state-approved sources.

Soils

1. The Proponents have reduced the area of disturbance to the absolute minimum necessary for construction and production operations while providing for the safety of the operation.
2. The Proponents have located pipelines immediately adjacent to roads to avoid creating separate areas of disturbance and to reduce the total area of disturbance.
3. The Proponents will avoid using frozen or saturated soils as construction material.
4. The Proponents will minimize construction in areas of steep slopes.
5. Cut slopes would be designed in a manner that would retain topsoil, and facilitate use of surface treatment such as mulch and subsequent revegetation.
6. The Proponents will selectively strip and salvage topsoil or the best suitable medium for plant growth from all disturbed areas. Topsoil would be removed and conserved to a minimum depth of 6 inches and a maximum of 12 inches from all drill locations, unless otherwise agreed by the BLM and the operator.
7. Where possible, disturbance to vegetated cuts and fills would be minimized on existing improved roads.
8. The Proponents would install runoff and erosion control measures such as water bars, berms, and interceptor ditches.

9. The Proponents would install culverts for ephemeral and intermittent drainage crossings. In addition, drainage crossing structures would be designed to carry the 25-year discharge event, or as otherwise directed by the BLM.
10. Layout of the access roads may require minor variations in routing to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. The Proponents would maintain a 100-foot wide buffer of natural vegetation (not including wetland vegetation) between construction and ephemeral and intermittent channels.
11. The Proponents would include adequate drainage control devices and measures in the design of roads (for example, berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipaters). These devices and measures would be located at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road to avoid erosive, concentrated flows. In conjunction with surface runoff or drainage control measures, the Proponents would use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. In addition, the Proponents would implement a revegetation program as soon as possible to reestablish the soil protection afforded by vegetation.

    When construction that is not specifically required for production operations is complete, the Proponents would restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and other facilities sites. The Proponents also would replace up to 6 inches of topsoil or suitable plant growth material over all disturbed surfaces.

Water Resources

1. The Proponents would limit construction of all drainage crossings to no-flow or low-flow periods.
2. The area of disturbance would be minimized within perennial, ephemeral, and intermittent drainage channels.
3. The BLM would prohibit construction of well sites and other non-linear features within 500 feet of surface water and riparian areas. BLM would grant possible exceptions for linear features based on an environmental analysis and site-specific mitigation plans.
4. The Proponents would design channel crossings to minimize changes in channel geometry and subsequent alterations in flow hydraulics.
5. Layouts of the access roads may require minor variations in routing to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. Where possible, a 100-foot wide buffer of natural vegetation (not including wetland vegetation) would be maintained between construction and ephemeral and intermittent channels.
6. Interceptor ditches, sediment traps, water bars, silt fences, and other revegetation and soil stabilization measures would be designed and constructed, as needed.
7. The Proponents would construct channel crossings by pipelines such that the pipe is buried a minimum of 4 feet below the channel bottom.
8. Disturbed channel beds would be regraded to the original geometric configuration and would contain the same or similar bed material.

9. Wells must be cased during drilling, and all wells cased and cemented in accordance with Onshore Order No. 2 to protect all high-quality aquifers. High-quality aquifers exhibit known water quality of 10,000 milligrams per liter total dissolved solids (TDS) or less. Well casing and cementing must be of adequate integrity to contain all fluids under high pressure during drilling and well completion. Furthermore, wells would adhere to the appropriate BLM cementing policy.
10. The reserve pits would be constructed in cut rather than fill materials. Fill material must be compacted and stabilized, as needed. The subsoil material of the pit to be constructed should be inspected to assess stability and permeability and to evaluate whether reinforcement or lining is required. If lining is required, the reserve pit must be lined with a reinforced synthetic liner at least 12 mils thick and with a bursting strength of 175 by 175 pounds per inch (American Society for Testing and Materials [ASTM] Standard D 75179). Use of closed or semi-closed drilling systems should be considered in situations where a liner may be required.
11. Two feet of freeboard must be maintained on all reserve pits to ensure they are not in danger of overflowing. Drilling operations must be shut down if leakage is found outside the pit until the problem is corrected.
12. Hydrostatic test water used in conjunction with pipeline testing, and all water used during construction must be extracted from sources that contain sufficient water quantities and with appropriation permits approved by the State of Wyoming.
13. The Proponents would develop and implement a pollution prevention plan (PPP) for storm water runoff at drill sites as required per WDEQ permit requirements.
14. The Proponents would exercise stringent precautions against pipeline breaks and other potential accidental discharges of oil or hazardous chemicals into adjacent streams. If liquid petroleum products are stored on site in sufficient quantities (per the criteria contained in Title 40 Code of Federal Regulations [CFR] Part 112), a Spill Prevention Control and Countermeasures (SPCC) plan would be developed in accordance with 40 CFR Part 112, dated December 1973 and updated in July 2002.
15. The Proponents would coordinate all crossings or encroachments of Waters of the U.S. with the U.S. Army Corps of Engineers (COE).
16. BLM must approve in writing any changes in the method or location for disposal of produced water.

Vegetation, Wetlands, and Noxious/Invasive Weeds

1. An approved Pesticide Use Proposal would be obtained before pesticides are applied on BLM surface ownership lands to control weeds.
2. Disturbed areas would be seeded and stabilized in accordance with BLM-approved reclamation guidelines.

Range Resources and Other Land Uses

1. The Proponents would coordinate with the affected livestock operators to ensure that livestock control structures remain functional (as directed by the livestock operator) during drilling and production operations, and to coordinate timing of activities.
2. Traffic control and speed limits would be used to limit potential conflicts between operators and livestock.

Wildlife and Fisheries

1. During reclamation, the Companies would establish a variety of forage species that would return the land to a condition that approximates its state before disturbance. In the short term, grasses and forbs would be established and in the long term, shrub species would establish themselves naturally when seeding conditions.
2. The Companies would prohibit unnecessary off-site activities of operational personnel near the drill sites. The Companies also would inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment.
3. Construction would not be allowed during critical nesting season (February 1-July 31) near active raptor nests. Seasonal timing restrictions within a "buffer zone" around nests to avoid disturbance to nesting raptors would reduce impact from construction activities. Exception requests may be granted if nests are found to be inactive or modified if there is visual screening of the nest that is determined by the BLM to be sufficient to minimize impacts.
4. Surface disturbing activities would not be allowed within ¼ mile of identified greater sage grouse leks.
5. The Companies would protect greater sage grouse nesting habitat during the breeding, egg-laying, incubation and early brood-rearing period (March 1 through June 30) by restricting construction within a 2-mile radius of active leks for greater sage grouse. Exceptions may be granted if the activity would not interfere with greater sage grouse nesting activity.
6. Construction activities in potential mountain plover nesting habitat during the nesting period (April 10 -July 10) would not be allowed unless an exception is granted. An exception may be granted if a survey for mountain plovers is conducted, within areas of potential habitat, prior to any surface disturbance in those areas, according to current mountain plover survey protocol and no plovers are found (USDI-FWS 2002).
7. All pits and open cellars must be fenced for the protection of wildlife and livestock. Fencing must be in accordance with BLM specifications. Netting must be placed over all production pits to eliminate any hazard to migratory birds or other wildlife. Netting is also required over reserve pits that have been identified as containing oil or hazardous substances (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 101 (14)), as determined by visual observation or testing. The mesh diameter will be no larger than 1 inch.
8. No known fish species are located within the JRPA.
9. Clearance surveys would be performed for threatened, endangered, proposed, candidate, and sensitive species of concern.

Recreation

1. The Proponents must minimize conflicts between project vehicles/equipment and recreation traffic by posting warning signs, implementing operator safety training, and requiring project vehicles to adhere to low speed limits.

Visual Resources

1. The Proponents must use existing topography to screen from view roads, pipeline corridors, drill rigs, wellheads, and production facilities.
2. The Proponents must paint structures, wells, and facilities with flat colors (such as Carlsbad Canyon or Slate Green) that blend with the adjacent undisturbed terrain. This measure does not apply to structures that require safety coloration in accordance with the requirements of the Occupational Safety and Health Administration (OSHA).

Cultural Resources

1. Avoidance is the preferred method for mitigating adverse effects to a property that is considered eligible for, or is already on, the National Register of Historic Places (NRHP).
2. Adverse effects to cultural or historical properties that cannot be avoided would be mitigated by implementing a cultural resources mitigation plan (including data recovery plan).
3. If cultural resources are discovered at any time during construction, all construction would halt and BLM would be immediately notified. Work would not resume until BLM issues a Notice to Proceed.

Socioeconomics

1. The Proponents would implement hiring policies that encourage use of local or regional workers who would not have to relocate to the area.
2. Project activities must be coordinated with ranching operations to minimize conflicts that involve movement of livestock or other ranch operations. Coordination would include scheduling project activities to minimize potential disturbance of large-scale livestock movements. The Proponents would establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.
3. The Proponents and their subcontractors would obtain Carbon County sales and use tax licenses for purchases made in conjunction with the project so that project-related sales and use tax revenues would be distributed to Carbon County.

Transportation

1. Existing roads would be used as collectors and local roads whenever possible. Standards for road design would be consistent with BLM Road Standards Manual Section 9113.
2. Roads that are not required for routine operation and maintenance of producing wells and ancillary facilities would be permanently blocked, reclaimed, and revegetated.
3. Areas with important resource values, steep slopes, and fragile soils would be avoided where possible in planning for new roads.

4. Permits are required from Carbon County for any access to or across a county road or for any pipeline that crosses a county road. These permits would be acquired before additional roads are built. All roads on public lands that are not required for operation and maintenance of field production would be permanently blocked, re-contoured, and seeded. Roads on private lands would be treated in a like manner, depending on the desires of the landowner.
5. The Proponents would be responsible for preventive and corrective maintenance of roads in the JRPA throughout the duration of the project. Maintenance may include blading, cleaning ditches and drainage facilities, abating dust, controlling weeds, or other requirements as directed by the BLM or the Carbon County Road and Bridge Department.
6. Except in emergencies, access would be limited to drier conditions to prevent severe rutting of the road surface. Culverts would be installed where needed to allow drainage in all draws and areas of natural drainage. Low water crossings would be used where applicable. On-site reviews would be conducted with BLM personnel for approval of proposed access before any construction begins.

Health and Safety

1. Sanitation facilities installed on the drill sites, and any resident camps would be approved by the WDEQ.
2. To minimize undue exposure to hazardous situations, the Proponents would comply with all applicable rules and regulations (such as Onshore Orders and OSHA requirements) that would prevent the public from entering hazardous areas and would post warning signs to alert the public of truck traffic.
3. The Proponents would haul all garbage from the drill site to a state-approved sanitary landfill for disposal. In addition, the Proponents would collect and store any garbage or refuse on location until it can be transported in containers approved by the BLM.

Hazardous Materials

1. SPCC Plans would be written and implemented as necessary, in accordance with 40 CFR Part 112, to prevent discharge into navigable waters of the United States.
2. If quantities that exceed 10,000 pounds or the threshold planning quantity (TPQ) as designated by the RFO are to be produced or stored in association with the project, chemical and hazardous materials would be inventoried and reported in accordance with the toxic release inventory (TRI) requirements set forth in Title III of the Superfund Amendments and Reauthorization Act (SARA) and codified at 40 CFR Part 335. The required Section 311 and 312 forms would be submitted at the specified times to the state and county emergency management coordinators and the local fire departments.
3. Any hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA), would be transported and disposed of in accordance with all applicable federal, state, and local regulations.
4. All storage tanks and compressor facilities that are designed to contain oil, glycol, produced water, or other fluid that may constitute a hazard to public health or safety, must be surrounded by a secondary means of containment for the entire contents of the largest single tank in use, plus 1 foot of freeboard. The Proponents would use 2-foot berms around

affected storage tanks and facilities. The containment or diversionary structure must be impervious to any oil, glycol, produced water, or other hazardous fluid for 72 hours. In addition, it would be constructed so that any discharge from a primary containment system would not drain, infiltrate, or otherwise escape to groundwater, surface water, or navigable waters before cleanup is completed.

Noise

1. The Proponents would muffle and maintain all motorized equipment according to manufacturer's specifications.
2. In any area of operations (such as a drill site or compressor station) where noise levels may exceed safe limits specified by OSHA, the Proponents would provide and require that employees use proper personal protective equipment.
3. The BLM will require that noise levels will be limited to no more than 10 decibels on the A-weighted scale (dBA) above background levels at leks for greater sage grouse that are located on public lands. The BLM will require that compressor engines located on public lands be enclosed in a building and located at least 600 feet away from sensitive receptors or sensitive resource areas to comply with these limits on noise levels.

2.2 ALTERNATIVE 2 – NO ACTION ALTERNATIVE

Section 1502.14(d) of NEPA requires that the alternatives analysis "include the alternative of no action." "No Action" implies that ongoing natural gas production activities, if any exist, would be allowed to continue by the BLM in the JRPA, but the proposed project would not be allowed. The JRPA has been disturbed by existing CBNG drilling. BLM would consider additional APDs and ROW actions for federal land on a case-by-case basis consistent with the scope of existing environmental analysis. Additional gas development could occur on state and private lands within the JRPA under APDs approved by the WOGCC.

The U.S. Department of the Interior's (USDI) authority to implement a "No Action" Alternative is limited because the public lands have already been leased. An explanation of this limitation and the USDI's discretion in this regard follows.

- An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (Form 3110-2). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms.
- Leases within the JRPA contain various stipulations concerning surface disturbance, surface occupancy and limited surface use. In addition, the lease stipulations provide that the USDI may impose "such reasonable conditions, not inconsistent with the purposes for which [the] lease is issued, as the [BLM] may require protecting the surface of the leased lands and the environment." None of the stipulations, however, would empower the Secretary of the Interior to deny all drilling activity because of environmental concerns.

- Provisions in leases that expressly provide authority to deny or restrict APD development in whole or in part would depend on an opinion provided by the U.S. Fish and Wildlife Service (FWS) regarding impacts to endangered or threatened species or habitats of plants or animals that are listed or proposed for listing (such as the bald eagle). If the FWS concludes that the Proposed Action and Alternatives would likely jeopardize the continued existence of any endangered or threatened plant or animal species, then the APDs and Atlantic Rim development may be denied in whole or in part.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The project was developed around measures provided in the ARPA Interim Drilling Policy - Development Authorized Concurrent with EIS Preparation for the Atlantic Rim Coalbed Natural Gas Project (Appendix A). Only alternatives that addressed allowable actions specified in the Interim Drilling Policy are considered in this analysis. All other alternatives would be considered only in the Atlantic Rim EIS.

During the alternative analysis, wells and ancillary facilities were analyzed to determine potential impacts to resources. A total of five wells were dropped during the alternative analysis because they resulted in impacts to wildlife, topography (steep slope), or excessive disturbance to soils and vegetation. These wells were replaced with new pad sites that would result in less impact to these resources.

The following wells were eliminated from consideration based on impacts to resources:

1. Well NW6 (T18N R90W Sec 6NW) – Located within ¼ mile of sage grouse lek.
2. Well SW31 (T19N R90W Sec.31 SW) – Removed due to disturbance to resources.
3. Well NW7 (T18N R90W Sec. 7 NW) – Removed due to disturbance to resources.
4. Well SW7 (T18N R90W Sec. 7 SW) - Removed due to access and road issues.
5. Well NW18 (T18N R90W Sec18 NW) – Removed due to topography and slope issues.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter is a summary of the affected environment for all resources potentially impacted by the Proposed Action. These resources are addressed based on management issues identified by the BLM, Great Divide Resource Management Plan, public scoping, and by interdisciplinary desktop and field analysis of the JRPA.

The Proposed Action could potentially affect critical elements of the human environment as listed in the BLM National Environmental Policy Act Handbook H-1790-1 (BLM 1988). Critical elements of the human environment, their status in the JRPA, and the potential to be affected by the Proposed Action are identified in **Table 3-1**. The items listed as none present will not be addressed in the EA because they would not be affected by the Proposed Action or the No Action Alternative.

Table 3-1
Elements of the Human Environment, Jolly Roger Project Carbon County, Wyoming, 2004

Element	Status in JRPA	Addressed in EA
Geology/Minerals/Paleontology	Potentially affected	Yes
Climate and Air Quality	Potentially affected	Yes
Cultural Resources	Potentially affected	Yes
Water Resources (surface and groundwater)	Potentially affected	Yes
Wildlife/Fisheries (Federally threatened/endangered, and sensitive species)	Potentially affected	Yes
Range Resources/Land Use	Potentially affected	Yes
Vegetation (including wetlands/riparian, noxious weeds)	Potentially affected	Yes
Recreation	Potentially affected	Yes
Visual Resources	Potentially affected	Yes
Socioeconomics	Potentially affected	Yes
Transportation	Potentially affected	Yes
Native American Religious Concerns	Potentially affected	Yes
Noise	Potentially affected	Yes
Hazardous or Solid Waste	Potentially affected	Yes
Soils	Potentially affected	Yes
Health and Safety	Potentially affected	Yes
Floodplains	None present	No
Wild and Scenic Rivers	None present	No
Wilderness	None present	No
Environmental Justice	None present	No
Areas of Critical Environmental Concern	None present	No
Prime and Unique Farmland	None present	No

3.2 GEOLOGY, MINERALS, AND PALEONTOLOGY

3.2.1 Physiography, Topography, and Landforms

The JRPA is located within the Great Divide Basin. Elevations in the JRPA range from 6,500 to 7,000 feet. The Great Divide Basin is bordered by branches of the Continental Divide and has no external outlet. None of the precipitation falling within the basin leaves through surface flow and there is no known groundwater discharge from the basin.

3.2.2 Geology

The Great Divide Basin is a sub-basin of the Greater Green River Basin, which consists of a complex series of basins separated by uplifts and ridges. During the late Cretaceous and early Tertiary Periods, eroding sediments from the surrounding highlands and mountains filled the Greater Green River Basin as it began to develop approximately 70 million years ago. The JRPA is located within the southeastern portion of the Great Divide Basin.

During most of the Late Cretaceous Period, the basin was beneath a relatively shallow epicontinental sea that extended from the Atlantic Ocean to the Gulf of Mexico. Four major transgressive-regressive cycles of this epicontinental sea have been recorded from the Middle Albian to the Middle Maestrictitian Period. By the middle of the early Maestrichian Period, the sea had retreated from south-central Wyoming.

The Upper Cretaceous Lance Formation underlies the JRPA and consists of sandstone, dark-gray or brown shale, coal, and lignite. This formation is underlain by the Lewis Shale and Fox Hills formations of the late Cretaceous Period. The Lewis Shale and Fox Hills formations were deposited during the final retreat of the epicontinental seas from the western interior. Exposures of the Lewis Shale and Fox Hills Formation occur along the eastern margin of the Great Divide and Washakie Basin. Lewis Shale is underlain by the Almond Formation, which consists of sandstone, siltstone, carbonaceous shale, and coal. In addition to the Almond formation, several other members of the Mesaverde Group (Allen Ridge, Pine Ridge) yield thin coal seams that exhibit potential for natural gas production.

Jolly Roger Project Area Coalbed Natural Gas Producing Formations

JRPA drilling intends to produce natural gas from coal, carbonaceous shale, and sandstone of the Mesaverde Group, including the Almond, Pine Ridge, and Allen Ridge Formations. The primary producing coals in other exploration pilot projects in the ARPA occur in the Pine Ridge and Allen Ridge Formations. Coal, sandstone, and carbonaceous shale within the Haystack Mountain Formation may also be tested for natural gas in the JRPA (Dewey 2004).

The Almond Formation contains three to nine individual coal beds interbedded with carbonaceous shale and sandstone. These coal beds have good lateral continuity. The average net coal thickness ranges between 4-10 feet, and locally reaches thicknesses greater than 15 feet. The sandstone beds range in thickness of between 2-8 feet. Individual sandstone beds may vary in thickness, but they appear to be laterally continuous. Porosity within the Almond sandstones ranges between 4-20 percent.

The Pine Ridge contains six to nine individual coal beds. Average net coal thickness for the Pine Ridge varies between 10-25 feet, and locally reaches thicknesses greater than 40 feet. Pine Ridge sandstone beds range in thickness of between 2-10 feet. Porosity within these sandstones varies between 5-20 percent.

The Allen Ridge Formation contains one to five individual coal beds. Thickness of individual coal beds ranges between 1-4 feet. These coals, unlike those in the Almond and the Pine Ridge, are more localized or less laterally continuous. Allen Ridge sandstones within the coal, carbonaceous shale, and sandstone interval vary between 2-14 feet. Porosity within the Allen Ridge sandstones ranges between 6-20 percent. Overburden mapping on top of the Almond Formation (Top of the Mesaverde Group) shows thickness varies between 1000 feet in the southeastern portion of the JRPA to 6000 feet in the northwestern portion of the area.

The main producing coals in the Pine Ridge Formation occur 250 ft.-300 ft. below the top of the Almond Formation. This would equate to burial depths between 1250 feet in the southeastern portion of the JRPA and 6250 feet in the northwestern portion of the area. Producing coals in the Allen Ridge Formation occur approximately 300 feet below the top of the Pine Ridge.

Stratigraphy of Mesaverde Formations in the Jolly Roger Project Area

The regional stratigraphy as applied to the proposed JRPA is established through correlation of wireline logs from the Pedco AR Fee 1890-5I well (SE Sec. 5 T18N R90W) with the cross sections of Roehler and Hansen (1989). The top of the Almond Formation represents the top of the Mesaverde Group. The depths of important Mesaverde Group stratigraphic markers as they occur in wells are shown in **Table 3-2**.

Table 3-2
Measured Depth of Important Stratigraphic Markers in the Pedco AR Fee 1890-5I Well

Stratigraphic Unit	Measured Depth
Almond Fm.	2368
Pine Ridge Fm.	2628
Allen Ridge Fm.	2904
Haystack Mtns. Fm.	4126
Hatfield Sandstone	4524
Deep Creek Sandstone	4754

Source: Dewey 2004.

3.2.3 Mineral Resources

The Great Divide Basin has been utilized for oil and gas drilling and production since the 1950's. Coal, natural gas, and oil are the three primary mineral resources found in the basin. Early production was mainly from upper Cretaceous reservoirs, primarily the Lewis Shale, Mesaverde, and Almond formations. Mineral development in the JRPA has been limited to natural gas and oil. At present, five coalbed natural gas exploratory unit agreements have been authorized for the Atlantic Rim.

3.2.4 Geologic Hazards

No major landslides or other geologic hazards have been mapped within the JRPA. In addition, seismic activity is low in the area.

3.2.5 Paleontology

Paleontologic resources include the remains or traces of any prehistoric organisms preserved by natural processes in the earth's crust (BLM Information Bulletin WY-93-371). The distribution and composition of fossil collections provide important information on the ecological and environmental conditions in Wyoming that existed during the Late Cretaceous Period. However, no specific data currently exists on deposits of high or undetermined paleontological potential within the JRPA.

3.3 CLIMATE AND AIR QUALITY

3.3.1 Climate

The JRPA is located in an arid to semiarid climate. Weather conditions usually consist of dry, windy conditions with limited precipitation. Meteorological data for the JRPA was collected at Rawlins, WY. However, it should be noted that meteorological data in the Great Divide Basin is limited.

The average annual precipitation at Rawlins is 10 inches, with rainfall and snowfall contributing equally to the total. On average, 51.9 inches of snow falls during the year, with March and January being the snowiest months.

Higher elevations in the region experience colder temperatures and greater precipitation. The average daily temperature during the winter ranges between a low of 5 F and a high of 33 F in January and a low of 48 F and a high of 86 F in July. The number of frost-free days varies with elevation, but normally occurs between mid-May and mid-September in the JRPA. The region has experienced several years of drought conditions.

The JRPA experiences strong winds caused by channeling and mountain valley flows in the varied topography. Winters are characterized by strong wind and snow, often creating blizzard conditions.

3.3.2 Air Quality

The National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS) set the upper limits for concentrations of specific criteria air pollutants. These pollutants include CO, nitrogen dioxide (NO_2), ozone (O_3), particulates (PM_{10}) ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb).

Under the prevention of significant deterioration program (PSD), the permitting agency must determine if a new or modified emission source will have an adverse impact on air quality values, including visibility. The JRPA has been designated a PSD Class II area, which allows a certain level of emissions as stipulated by the permitting agency (BLM 2004).

Emission sources in the JRPA are limited, consisting of only a few industrial facilities and scattered residences. Additionally, the atmospheric conditions in the JRPA result in good dispersion of pollutants. Background values of criteria air pollutants in the region are well below the NAAQS, WAAQS, and the Colorado Ambient Air Quality Standards (CAAQS).

Background data for criteria pollutants in the region was provide by the WDEQ AQD, and the Colorado Department of Public Health and Environment, Air Pollution Control Division (CDPHE APCD 1996). **Table 3-3** shows the regional background concentrations of criteria air pollutants, WAAQS, CAAQS, NAAQS, and Class I and II increments against legal baseline provided by the WDEQ and CDPHE. Background pollutant concentrations provide data to compare predicted impacts with applicable air quality standards.

The comparisons made to PSD Class 1 and II increments are intended to evaluate an "impact threshold" and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is the responsibility of the WDEQ with oversight from the Environmental Protection Agency (EPA).

Air Quality Related Values

In addition to ambient air quality standards and PSD increments, Air Quality Related Values (AQRV's), which include the potential air pollution effects on visibility and the acidification of surface water bodies, is a concern for sensitive Class 1 and Class II areas.

Visibility is often defined in terms of atmospheric light extinction or visual range, which is the furthest distance a person can see a landscape feature. Impairment of visibility is expressed in terms of deciview (dv). The deciview index was developed as a linear perceived visual change. A change in visibility of 1.0 dv represents a "just noticeable change" by the average person under most circumstances. Larger deciview values translate into greater visibility impairment. The Forest Service (FS) has identified specific "Level of Acceptable Change" (LAC) values which they use to evaluate potential air quality impacts within wilderness areas. Continuous visibility related background data collected as part of the Interagency Monitoring of PROtected Visual Environments (IMPROVE) program are available for two sensitive receptors within the study area: Bridger and Mt. Zirkel Wilderness. The Bridger data represents existing conditions at the Bridger, Fitzpatrick, and Popo Agie wilderness areas and the Wind River Roadless Area, while the Mt Zirkel data best represents existing conditions for Dinosaur National Monument and the Mt. Zirkel, Savage Run, and Rawah wilderness areas (BLM 2004).

Both the Bridger and Mt. Zirkle visibility conditions are similar. **Table 3-4** summarizes the seasonal visibility conditions at Bridger Wilderness. As indicated, seasonal visibility in the region is very good.

Table 3-3
Background Concentrations and Ambient Air Quality Standards

Pollutant and Averaging Time	Background Concentration	Wyoming Ambient Air Quality Standards	Colorado Ambient Air Quality Standards	National Ambient Air Quality Standards	PSD Class 1 Increment	PSD Class II Increment
Carbon Monoxide (CO)						
CO 1-hr	2,299	40,000	40,000	40,000	None	None
CO 8-hr	1,148	10,000	10,000	10,000	None	None
Nitrogen Dioxide (NO_2)						
NO_2 Annual	10[B]	100	100	100	2.5	25
Ozone (0_3)						
O_3 1-hr	144[d]	None	None	235	None	None
O_3 8-hr	139 [d]	157	157	157	None	None
Particulate Matter less than 10 microns (PM_{10})						
PM_{10} 24-hr	20[c]	150	150	150	8	30
PM_{10} Annual	12[c]	50	50	50	4	17
Particulate Matter less than 2.5 microns ($PM_{2.5}$)						
$PM_{2.5}$ 24-hr	10[e]	None	None	65	None	None
$PM_{2.5}$ Annual	6[e]	None	None	15	None	None
Sulfur Dioxide (SO_2)						
SO_2 3-hr	29[f]	1,300	700	1,300	25	512
SO_2 24-hr	18[f]	260	365	365	5	91
SO_2 Annual	5[f]	60	80	80	2	20

Note: Effective February 27, 2001 the U.S. Supreme Court upheld the EPA's position on the proposed national 8-hr ozone and $PM_{2.5}$ standards. Implementation of these standards is pending.

The ozone 1-hr background concentration represents the 90th percentile of the annual maximum daily 1-hr concentrations for the months April through August.

The 8-hour ozone background concentration represents the average annual 4th highest daily maximum 8-hour average.

Other short-term background concentrations represent the second highest measured value.

Sources:

a. CDPHE, 1996 – Data collected at Rifle and Mack, Colorado in conjunction with proposed oil shale development during early 1990s.
b. BLM 1996b – To supplement monitored NO_2 data, a separate NO_2 modeling analysis was performed which included many NO_x emission sources.
c. WDEQ, 1997 data collected for the Carbon County UCG Project, data collected 9 miles west of Rawlins, WY, June 1994-November, 1994
d. Clean Air Status and Trends Network, n.d. – Data collected at Pinedale, WY (1997-1999).
e. Background $PM_{2.5}$ concentrations estimated at one-half of PM_{10} values based on EPA literature.
f. CDPHE-APCD, 1996 – Data collected at the Craig Power Plant site and Colorado Oil Shale areas from 1980-1984.

Table 3-4
Baseline Standard Visual Range for the Bridger Wilderness Area

Season	Standard Visual Range (kilometers)	Deciview (Unitless)
Annual	175	8.1
Spring	165	8.6
Summer	162	8.8
Autumn	169	8.4
Winter	218	5.9

Acidification of surface waters bodies is a concern for high altitude lakes located within FS wilderness areas. Atmospheric acid deposition is monitored as part of the National Acid Deposition Program/National Trends Network near Pinedale, Wyoming. Although the monitored deposition values are well below those levels needed to damage vegetation, lower levels of deposition may exceed the acid neutralizing capacity (ANC) of sensitive high mountain lakes.

To determine potential acid deposition impacts, the FS utilizes an LAC of no greater than 1 microequivalent/liter (eq/l) change in ANC for sensitive water bodies with existing ANC levels less than 25 eq/l. A ten percent change in ANC is considered significant for lakes with existing ANC levels over 25 eq/l. **Table 3-5** shows baseline ANC levels for sensitve mountain lakes in the region.

Table 3-5
Background ANC for Monitored Wilderness Lakes

Wilderness Area	Water Body	Background ANC (ueq/l)
Bridger	Black Joe Lake	69.0[a]
	Deep Lake	61.0[a]
	Hobbs Lake	68.0[a]
	Upper Frozen Lake	5.7[a]
Fitzpatrick	Ross Lake	61.4[a]
Popo Agie	Lower Saddlebag Lake	55.5[a]
Mount Zirkle	Pothole A-8	16.0[a]
	Seven Lakes	35.5[d]
	Upper Slide Lake	24.7[d]
Medicine Bow	West Glacier	26.1[c]
Rawah	Island Lake	64.6[a]
	Rawah #4 Lake	41.2[a]

Note: The basis for ANC data is the 10th percentile of measurements at the lake outlet when greater than years of data exist. When 5 or less years of data are available, average values are used.

Sources:

a. D. Haddow, USDA-FS, 2001.
b. T. Svalberg, USDA-FS, 2000.
c. R. Musselman, USDA-FS, 2001.
d. A. Mast, USGS, 2001.

3.4 SOILS

Texas Resource Consultants (1981) and Wells *et al*. (1981) prepared an Order III soil survey for the RFO, in cooperation with the Natural Resource Conservation Service (then Soil Conservation Service). An Order III soil survey will typically include a map scaled at 1:20,000 to 1:63,360, containing soil map units approximately 4 to 40 acres in size that delineate soil associations and complexes. This soil survey provides the best available soils data for the JRPA.

The southern portion of the JRPA (T18N R90W Sections 17, 18, 7, 8, and 9) and the northern portion of the JRPA (T19N R90W western portion of Section 33 and the eastern portion of section 32) are dominated by the Diamondville-Blazon-Forelle Association. In general, this soil unit is composed of well drained medium textured soils with moderate permeability, precipitation averages 10 to 14 inches, and the average frost-free season is about 90 days. The hazard of water erosion ranges from low to severe. Characteristics of the Diamondville-Blazon-Forelle Association are presented in **Table 3-6**.

Table 3-6
Diamondville-Blazon-Forelle Association

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard
241	Diamondville-Blazon-Forelle Association	Diamondville - 40%	Sideslopes	3 to 15 %	Soft, calcareous sedimentary rock.	Medium	Well drained	Moderate	Moderate	Low to moderate
		Blazon - 20%	Ridges	3 to 15%	Shale, siltstone, and sandstone	Medium to rapid	Well drained	Moderate	Low	Moderate to severe
		Forelle - 20%	Valley	3 to 10%	Sedimentary rock	Medium	Well drained	Moderate	High	Low to moderate

Blazon-Shinbara Complex (6 to 40 percent slopes) is located throughout the JRPA in T18N R90W Sections 4, 6, 8, 9, and 17 and T19N R90W Section 33. In general, this soil unit is composed of well drained shallow soils with moderate permeability, precipitation averages 10 to 14 inches, and the average frost-free season is about 90 days. The hazard of water is moderate to severe. Characteristics of the Blazon-Shinbara Complex are presented in **Table 3-7**.

Table 3-7
Blazon-Shinbara Complex

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard
235	Blazon-Shinbara Complex	Blazon - 45%	Ridges and sideslopes	6 to 20%	Shale, siltstone, and sandstone	Medium to rapid	Well drained	Moderate	Low	Moderate to severe
		Shinbara - 30%	Ridges and sideslopes	6 to 40%	Shale, siltstone, and loamstone	Medium to rapid	Well drained	Moderate	Low	Moderate to severe

The Cushool-Worfman-Blackhall complex is present in the southern portion of the JRPA (T18N R90 W, the eastern portion of sections 7). The soils of this complex are highly intermingled on the ridges and upper sidehill slopes. The hazard of water and wind erosion ranges from moderate to severe. Characteristics of the Cushool-Worfman Blackhall Complex are presented in **Table 3-8**.

Table 3-8
Cushool-Worfman-Blackhall Complex

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard	Wind Erosion Hazard
236	Cushool-Worfman-Blackhill Complex	Cushool - 35%	Sidehill slopes	6 to 15 %	Residium from sandstone or sandy shale	Medium to rapid	Well drained	Moderate	Low	Moderate to severe	Moderate to severe
		Worfman - 20%	Ridges and upper sidehill slopes	6 to 20%	Soft sandstone	rapid	Well drained	Moderate	-	Severe	Moderate to severe
		Blackhall - 20%	Ridges and upper sidehill slopes	10 to 30%	sandstone	rapid	Shallow and well drained	Moderate	-	Severe	Moderate to severe

The northern most portion of the JRPA (T19N R90 W section 32 and northern most portion of section 5) is dominated by the Seaverson-Blazon Complex. The Seaverson and Blazon soils are intermingled in the landscapes and the areas where each of these soils occur depends primarily on the underlying bedrock. The Seaverson soils form in very strongly alkaline shales or sandy shales, and the Blazon soils form in materials over loamstone. Characteristics of the Seaverson-Blazon complex are presented in **Table 3-9**.

Table 3-9
Seaverson-Blazon Complex

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard	Wind Erosion Hazard
237	Seaverson-Blazon Complex	Seaverson clay loam- 40%	Rolling upland ridges	3 to 10%	Shale	Slow to medium	Well drained	Moderately slow	Low	Moderate	Slight to moderate
		Blazon Loam- 30%	Rolling upland ridges	6 to 15%	Shale, Siltstone, and Sandstone	Slow to Medium	Well drained	Moderate	Low	Moderate	Slight to moderate

The northwestern portion of the JRPA (T19N R90W Section 31) has one dominant soil type, the Cusholl-Rock River Association. Characteristics of the Cushool-Rock River Association are presented in **Table 3-10**.

Table 3-10
Cushool-Rock River Association

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard	Wind Erosion Hazard
225	Cushool-Rock River Association	Cushool Sandy Loam-50%	Smoothly rolling uphill surfaces	3 to 10%		Slow to medium	Well drained	Moderate	Moderate	Moderate	Moderate to severe on unprotected soils
		Rock River Sandy Loam-30%	Valley slope positions leading into narrow drainages	6 to 20%	Calcareous residual sandy shales and sandstones	Slow to medium	Well drained	Moderate	Moderate	Moderate	Moderate to severe on unprotected soils

The northern portion of the JRPA (T18N R90W southern portion of Sections 5 and the west portion of section 4) contains the Forelle-Patent Association. Characteristics of the Forelle-Patent association are presented in **Table 3-11**.

Table 3-11
Forelle-Patent Association

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard	Wind Erosion Hazard
233	Forelle-Patent Association	Forelle Loam-40%	Valley	3 to 6%	Sedimentary rock	Slow to Medium	Well drained	Moderate	High	Slight to moderate	Slight
		Patent Loam-30%	Gentle to moderate slopes	3 to 10%	Local alluvium or slope wash	Slow to medium	Well drained	Moderate	High	Slight to moderate	Slight

The Grieves-Blackhall Association is located in the southeastern portion of the JRPA (T18N R90W Section 9). In general, this soil unit is composed of well drained soils with moderate permeability and moderate water erosion hazard. Characteristics of the Grieves-Blackhall Association are presented in **Table 3-12**.

Table 3-12
Grieves-Blackhall Association

Map Unit #	Map Unit Name	Series (% of map unit)	Landscape Position	Slope	Soil Parent Material	Runoff	Drainage Class	Permeability	Available Water Capacity	Water Erosion Hazard
251	Grieves-Blackhall Association	Grieves Sandy Loam-55%	Alluvial fans and gently sloping uplands	Moderately steep upperslopes and ridge crests at elevations of 6500 to 7800 feet	Alluvium	Medium	Well drained	Moderate	Moderate	Moderate
		Blackhall Sandy Loam-30%	Sloping to moderately steep upper slopes and ridge crests	Moderately steep upperslopes and ridge crests at elevations of 6500 to 7800 feet	Soft sandstone residuum	Medium to rapid	Well drained	Moderate	Very low	Moderate

3.4.1 Biological Soil Crusts

Biological soil crusts are a component of Wyoming's semiarid rangelands, especially in the Wyoming big sagebrush cover type. Biological soil crusts are predominantly composed of cyanobacteria (formerly blue-green algae), green and brown algae, mosses, and lichens. Liverworts, fungi, and bacteria can also be important components. Because they are concentrated in the top 1-4 mm of soil, they primarily affect processes that occur at the soil surface or soil-air interface, including soil stability, decreased erosion potential, atmospheric nitrogen fixation, nutrient contributions to plants, soil-plant-water relations, infiltration, seeding germination, and plant growth. Crusts are well adapted to severe growing conditions, but poorly adapted to compressional disturbances such as trampling by humans, livestock, wild horses, wildlife, or vehicles. Disruption of the crusts decreases organism diversity, soil nutrients, stability, and organic matter (Belnap *et al*. 2001). The presence of biological soil crusts on or near the JRPA has not been verified, but they may potentially occur.

3.5 WATER RESOURCES

3.5.1 Groundwater

Groundwater resources include deep and shallow confined and unconfined aquifers. Site specific data on groundwater for the JRPA are limited. The producing coal seams in the Mesaverde Group are classified as confined to semi-confined because they are bounded by confining layers that consist of impervious to semi-pervious layers of shale and siltstone. Hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams is limited. Deep injection wells are proposed for the Cherokee and Deep Creek Sandstones, which occur between 3,800 feet to 4,600 feet below the surface. The rocks that compose the Mesaverde group are conglomerates, consisting of sandstone, siltstone, mudstone, claystone, carbonaceous shale, limestone, and coal. Because these rocks were deposited as sea level changed during the Late Cretaceous Period, lithology varies vertically and laterally, and intertounging is common among the various formations and strata that make up these aquifers. Recharge is mainly from infiltration of snowmelt and rainfall.

3.5.1.1 Quality

Groundwater quality is related to aquifer depth, flow between aquifers, and the rock type. Groundwater quality is variable in the JRPA. TDS, an indicator of salinity, is generally less than 2,000 milligrams per liter (mg/L) (slightly saline to saline) in the JRPA producing formations, with local concentration of less than 500 mg/L (considered fresh and meeting EPA National Secondary Drinking Water Regulations).

The proposed JRPA wells occur in the Mesaverde Group aquifers. **Table 3-13** lists the major cation and anion composition of groundwater from the Mesaverde Group in the JRPA. Sodium and bicarbonate dominate as the major ionic species. Collentine *et al*. (1981) offer three possible explanations for this dominance: (1) exchange of dissolved calcium for sodium; (2) sulfate reduction, resulting in generation of bicarbonate; and (3) intermixing of sodium-rich, saline water from low-permeability zones within the Mesaverde or adjacent aquifers.

Table 3-13
Major Ion Composition of Mesaverde Groundwater

Cation	Concentration (mg/L)	Anion	Concentration (mg/L)
Sodium	513	Bicarbonate[a]	1,284
Calcium	7	Carbonate[b]	9
Magnesium	3	Chloride	56
Potassium[b]	5	Sulfate	11

Notes:

a. Bicarbonate was not measured; value shown was calculate from ion balance.

b. Concentrations of potassium and carbonate were not measure in well samples; values represent composite of USGS data for Mesaverde wells in the vicinity of the project (USGS 1980) mg/L= milligrams per liter.

Table 3-14 presents a comparison of groundwater quality from the Mesaverde Group, including WDEQ standards for groundwater suitability. The results from three gas wells analyzed indicate water that is generally suitable for livestock use, but is unsuitable for domestic supply or irrigation without treatment or dilution. Parameters measured at concentrations that exceed drinking water standards include iron, manganese, and TDS. Calculated values for sodium adsorption ration (SAR) (47.3) and residual sodium carbonate (41 milliequivalents per liter (meq/L) exceed the agriculture suitability limits of 8 for SAR and 1.25 for residual sodium carbonate. Unless the water supply were mixed with an existing water source of lower sodium, bicarbonate, and lower total salinity, irrigation with this water would reduce infiltration in the affected soil and potentially decrease crop production.

Table 3-14
Groundwater Quality for Mesaverde Wells in the JRPA

Parameter	Concentration[a]	Unit	Groundwater Suitability Standards[b]		
			Domestic	Agriculture	Livestock
Aluminum	0.045	mg/L	---	5	5
Ammonia	0.9	mg/L	0.5	---	---
Arsenic	0.0006	mg/L	0.05	0.1	0.2
Barium	0.36	mg/L	1	---	---
Beryllium	<0.002	mg/L	---	0.1	---
Boron	0.25	mg/L	0.75	0.75	5
Cadmium	<0.0002	mg/L	0.01	0.01	0.05
Chloride	56	mg/L	250	100	2,000
Chromium	0.002	mg/L	0.05	0.1	0.05
Cobalt	NM	mg/L	---	0.05	1
Copper	0.03	mg/L	1	0.2	0.5
Cyanide	<5	mg/L	0.2	---	---
Fluoride	1.0	mg/L	1.4 - 2.4	---	---
Hydrogen Sulfide	NM	mg/L	0.05	---	---
Iron	3.06	mg/L	0.3	5	---
Lead	0.004	mg/L	0.05	5	0.1
Lithium	NM	mg/L	---	2.5	---
Manganese	0.102	mg/L	0.05	0.2	---
Mercury	<0.0004	mg/L	0.002	---	0.00005
Nickel	0.041	mg/L	---	0.2	---
Nitrate	<0.03	mg/L	10	---	---
Nitrite	<0.03	mg/L	1	---	10
Oil & Grease[c]	<1	mg/L	Virtually Free	10	10
Phenol	65	mg/L	0.001	---	---
Selenium	<0.005	mg/L	0.01	0.02	0.05
Silver	<0.003	mg/L	0.05	---	---
Sulfate	11	mg/L	250	200	3000
TDS	1,322	mg/L	500	2000	5000
Uranium	NM	mg/L	5	5	5
Vanadium	NM	mg/L	---	0.1	0.1
Zinc	0.3	mg/L	5	2	25
pH	8.2	s.u.	6.5 - 9.0	4.5 - 9.0	6.5 - 8.5
SAR	47.3	<none>	---	8	---
RSC[d]	41	meq/L	---	1.25	--
Radium 226 + Radium 228	0.9	pCi/L	5	5	5
Strontium 90	NM	pCi/L	8	8	8
Gross alpha	NM	pCi/L	15	15	15

a. Concentrations of boron, ammonia, fluoride, and nitrate/nitrite in samples from 11 Mesaverde groundwater wells (USGS 1980); remaining concentrations from three Mesaverde gas wells in JRPA.
b. From WDEQ Water Quality Rules and Regulations, Chapter VIII.
c. Reported as total petroleum hydrocarbons.
d. Residual sodium carbonate calculated from measured calcium and magnesium concentrations and calculated concentration of bicarbonate.

Notes:
meq/L = Milliequivalents per liter
mg/L = Milligrams per liter
NM = not measured
pCi/L = Picocuries per liter
s.u. = Standard units
TDS = Total dissolved solids

3.5.2 Surface Water

The JRPA is located within the Great Divide Basin Watershed (United States Geological Service [USGS] Hydrologic Unit Code 14040200). The Great Divide Basin is a closed basin. Many of the drainages within or near the JRPA are ephemeral (i.e. carry water only in direct response to snow melt and precipitation events). Surface waters near the JRPA include the intermittent to perennial Separation Creek, intermittent Fillmore Creek, and several other intermittent or ephemeral drainages that flow into Separation or Fillmore Creek.

3.5.2.1 Quantity

Statistics on flow have been compiled for the USGS gaging station (#09216527), which is located on Separation Creek. There are no stream gaging stations in the JRPA. This information is summarized in **Table 3-15**.

Table 3-15
Historical Streamflow at Selected USGS Gaging Stations

Station Name	Station Number	Drainage Area (mi^2)	Period Of Record	Mean Annual Flow (cfs)	Mean Annual Flow (ac-ft/year)	Maximum Peak Flow (cfs)	Annual Runoff (ac-ft/yr)
Separation Creek near Riner, WY	09216527	53.3	10/1/75-9/30/81	2.1	1,520	141	1,300

Source: USGS 2003
mi^2 = square mile
cfs= cubit feet per second
ac-ft/yr= acre-feet per year

Peak flow typically occurs during April and May in response to snow melt, and many drainages and streams will be dry by early June. Following peak flow events, these streams and drainages only flow in direct response to rainfall events. Lowham (1976) estimated long-term flow characteristics at Station #09216527. These estimates were based on channel and basin characteristics and are summarized in **Table 3-16**.

Table 3-16
Long-Term Flow Estimates at Separation Creek

Station Name And Number	2-Year Peak Flow	5-Year Peak Flow	10-Year Peak Flow	25-Year Peak-Flow	50-Year Peak Flow	Average Annual Runoff
Separation Creek near Riner, WY 09216527	39 cfs	100 cfs	170 cfs	290 cfs	420 cfs	1,500 ac-ft/yr (2.07 cfs)

Source: Lowham 1976
cfs= cubit feet per second
ac-ft/yr= acre-feet per year

3.5.2.2 Reservoirs

There are three existing reservoirs in the JRPA. Fillmore Reservoir #1 is located in Section 6 in T18N R90W, this reservoir is 100 acre-feet in capacity and was permitted for stock water and waterfowl habitat. Fillmore Reservoir #1 is in poor structural condition and has lost the capacity to hold 100 acre-feet of water due to the accumulation of silt. Fillmore Reservoir #2 is located in Section 8 in T18N R90W. This reservoir is 4 acre-feet in capacity and was permitted for stock water. Fillmore Reservoir #2 is also in poor condition and has lost some water storage capacity due to the accumulation of silt. The third reservoir is located on a non-federal parcel of land (Newberry 2004a).

3.5.2.3 Quality

Data on water quality collected at the USGS monitoring station on Separation Creek are shown in **Table 3-17**. In general, because many of these streams only flow in response to precipitation events, sediment loads can be high. In addition, many areas with saline soils generally have higher TDS values. Very little water quality data is available for the JRPA, however some data is available for Separation Creek (which is a characteristic stream found in the Great Divide Basin watershed).

Table 3-17
Surface Water Quality – Separation Creek Near Riner, WY

Station Name	Separation Creek Near Riner, WY
Station Number	09216527
Period of Records	1975-1981
Number of Samples[b]	39
pH, standard units	8.20
Total Dissolved Solids (TDS)[c]	774
Total Suspended Solids	363
Turbidity (JTUs)[d]	131
Hardness as $CaCO_3$	467
Dissolved Oxygen	9.01
Sodium	80.4
Calcium	74.4
Magnesium	68.6
Potassium	5.5
Bicarbonate	276
Sulfate	385
Chloride	13
Nitrate	0.14
Sodium Adsorption Ration (SAR), unitless	1.6

Source: USGS 2004

a. Values all representative of means
b. Total number of grab samples analyzed; not every parameter was analyzed in every sample.
c. All units are milligrams per liter (mg/L) except as noted
d. Jackson Turbidity Units.

3.5.2.4 Waters of the United States

The Great Divide Basin has no external outlet and surface waters have no known connection to external drainages or to navigable waterways leaving the state. As a result, surface water features in the JRPA are not part of a tributary system to interstate waters or navigable waters and do not qualify as Waters of the United States.

3.5.2.5 Water Use

Surface water use in the Great Divide Basin is dominated by irrigation, although this use is limited. Estimates of water use for the Great Divide Basin by the USGS indicate that in 1995 total surface water withdrawals equaled 103.2 million gallons per day (MGD). Irrigation represented 99 percent of surface water withdrawals (estimates of surface water withdrawals for irrigation totaled 102.7 MGD) (USGS 1995).

3.5.2.6 Water Rights

Surface water rights do exist on the JRPA and are on file with the Wyoming State Engineer Office (WSEO).

3.6 VEGETATION, WETLANDS, AND INVASIVE WEEDS

3.6.1 Vegetation and Cover Types

Vegetation in the JRPA is primarily dominated by Wyoming big sagebrush (*Artemisia tridentada ssp wyomingensis*). The JRPA is located within the High Plains SE (10" -14") precipitation zone, Region 9 (USDA-NCRS 1986).

Vegetation cover types for the JRPA were obtained from the Wyoming Geographic Information Science Center and used to delineate primary and secondary vegetation cover type boundaries. Information for plant species of concern was obtained from the Wyoming Natural Diversity Database (WYNDD) (WYNDD 2003). Based upon the Wyoming Gap Analysis Program (GAP, Merrill *et al*. 1996), Wyoming big sagebrush is the primary cover type on the entire JRPA (100 %). Secondary cover types are greasewood fans and flats (1.6 %), basin exposed rock/soil (56.7 %), with the remaining 41.7 % of the area unclassified (**Table 3-18**).

Table 3-18
Vegetation Cover Types within the JRPA as Identified by the Wyoming Gap Analysis (Merrill et al. 1996).

Vegetation Cover Type	Primary		Secondary	
	Acres	Percent	Acres	Percent
Wyoming big sagebrush	3,910.5	100.0	------	------
Basin exposed rock/soil	------	------	2,214.8	56.7
Greasewood fans and flats	------	------	63.7	1.6
Unclassified	------	------	1,632	41.7
TOTAL	3,910.5	100.0	3,910.5	100.0

The Wyoming big sagebrush cover type description from the Wyoming GAP analysis (Merrill *et al*. 1996) is as follows: "Total shrub cover in this type comprises more than 25% of the total vegetative cover. This type is variable in Wyoming and ranges from dense, homogeneous Wyoming big sagebrush to sparsely vegetated arid areas where Wyoming big sagebrush is the dominant shrub. Often, patches of Wyoming big sagebrush are found with patches of mixed grasses. In these cases the type is classified as Wyoming big sagebrush steppe if the sagebrush patches occupy more than 50 percent of the total landscape area and as mixed grass if the grasses occupy more than 50 percent of the total area". Resolution of the GAP data is approximately 100 hectares (248 acres), therefore, smaller stands of some secondary cover-types such as basin big sagebrush (*Artemisia tridentata ssp. tridentata*) and cushion plant communities, although present, may fail to appear on the map and their extent cannot be calculated.

On-site measurements performed on May 20, 2004 indicated that sagebrush canopy cover values on the JRPA ranged from approximately 10-15 percent to >40 percent. The 10-15 percent value is common for the general area and increases to about 40 percent in proximity to ephemeral drainage sites where soils are deeper. Based on several measurements, Wyoming big sagebrush

plant density (stems/unit area) was estimated to be approximately 10,000 plants/acre; average height (H) ranged from 30-40 cm.

Major draws in the JRPA usually have linear stands of basin big sagebrush that parallel the draw. Average sagebrush height along several of these draws ranged from 150-163 cm. Greasewood (*Sarcobatus vermiculatus*) is commonly intermixed with sagebrush along Fillmore Creek. Both the native rabbitbrush species (*Chrysothamnus nauseosus* and *C. viscidiflorus*) are present in the JRPA. Several small saltbush (*Atriplex gardneri*) dominated communities also occur on the JRPA and these sites are characterized by an accumulation of salt in poorly developed soils with a pH of 7.8 to 9.

Dominant grasses are mostly in the wheatgrass family; Basin wildrye (*Leymus cinereus*) is common along Fillmore Creek. Grasses occupy all shrub interspaces with a minimum of bare ground. Annual production (shrubs and grasses) is probably high for this area. Common forb species include the phloxs, buckwheats, penstemons, dandelion (*Taxafolium offinale*), Plains prickly-pear cactus (*Opuntia* sp.), scurfpea (*Psoralea tenuiflora*), Indian paintbrush (*Castilleja* sp.), and arrowleaf balsamroot (*Balsamorhiza sagittata*).

3.6.2 Federal Threatened and Endangered Plant Species

Three federally listed plant species, the blowout penstemon (*Penstemon haydenii*), Ute-ladies'-tresses (*Spiranthes diluvialis)*, and Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) are listed as potentially occurring on lands administered by the RFO (USDI-FWS 2003). However, only the blowout penstemon and Ute-ladies'-tresses could potentially occur in the Carbon County portion of lands administered by the RFO.

Blowout penstemon

Blowout penstemon is a member of the Scrophulariaceae (Figwort) family (Fertig 2001) and is one of the rarest plant species native to the Great Plains (Nebraska Game and Parks Commission [NGPC] 2002). The species is found in the open, sandy habitats of wind-excavated depressions (blowouts) in dune tops. In Wyoming, the species has also been documented on very steep, unstable sand dunes. Within these limited habitats, this short-lived perennial herb frequently occurs in large, multi-stemmed clumps. In June and July, when it is in bloom in Wyoming, its lavender-purple flowers stand out against other sparse vegetation found in and around sandy blowouts.

Blowout penstemon, a FWS endangered species, is known to occur in certain habitats south of the Ferris Mountains in the northern part of Carbon County. Suitable habitat for blowout penstemon is not present in the JRPA, but the plant has the potential to occur approximately ten miles south of the JRPA (Fertig 2001), in the Sand Hills area where a few active sand dunes are known to exist. However, the species was not found during field surveys of the Sand Hills area by WYNDD personnel in June 2000 (Fertig 2001). The closest known populations of blowout penstemon are located south of the Ferris Mountains (Blomquist 2003). Given the absence of suitable habitat (sand dunes with active blowouts) in the JRPA, blowout penstemon does not occur within the JRPA.

Ute ladies'-tresses

The Ute ladies'-tresses (Spiranthes diluvialis), a federally threatened species, is a perennial, terrestrial orchid, endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200 to 7,000 feet. The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. This species has been located in Converse, Goshen, Laramie, and Niobrara counties in Wyoming (Fertig 2000). Ute ladies'-tresses typically blooms from late July through August, however, it has been known to bloom in early July and as late as early October (USDI-FWS 2003). Suitable habitat for the Ute ladies'-tresses does not occur within the JRPA and this species is not expected to occur there.

3.6.3 Species of Concern

Seven plant species of special concern may potentially occur on or near the JRPA (USDI-BLM 2002, WYNDD 2003). Plants of special concern that may occur in the RFO management area and information on their names, sensitivity status, probability of occurrence in the JRPA, and descriptions of habitat types in which these special concern plants are found are listed in **Table 3-19**. Of these, Gibben's beardstongue has the highest conservation priority (WYNDD 2003) and particular attention should be given to avoid impact to this species. None of the species listed have known occurrences within the JRPA (WYNDD 2003). The seven sensitive plant species have moderate potential to occur on or near the JRPA.

Table 3-19
Sensitive Plant Species with Potential to Occur on or near the JRPA

Common Name	Scientific Name	Status1	Habitat	OP
Smallflower androstephium	*Androstephium breviflorum*	G5/S1	Open, south-facing slopes; erosional slopes; deep sandy-silty-loamy soils	M
Hayden's milkvetch	*Astragalus bisculatus var. haydenianus*	G5T4?/S1	Moist clay soils; spring draws; associate with dense graminoids and shrubs 6600 to 7660'	M
Nelson's milkvetch	*Astragalus nelsonianus*	G2/S2	Alkaline clay flats, shale bluffs, pebbly slopes and volcanic cinders in sparsely vegetated sagebrush, juniper & barren clay slopes 6500 to 8200'	M
Wolf's orache	*Atriplex wolfii*	G3/G4/S1	Alkaline or clay soils; elevated mounds near aquatic sites; associated with greasewood	M
Gibben's beardtongue	*Penstemon gibbensii*	G1/S1	Barren south-facing slopes on loose sandy-clay derived from Brown's Park formation; may occur in grass-dominated sites with scattered shrubs; semi-barren fringed sagebrush/thickspike wheatgrass communities with 15-20% vegetation cover, or ashy slopes amid *Cercocarpus montanus*; may also occur on outcrops of Green River Formation on steep yellowish sandstone-shale slopes below caprock edges.	M
Pale blue-eyed grass	*Sisyrinchium pallidum*	G2G3/S2S3	Wet meadows, stream banks, roadside ditches & irrigated meadows 7000 to 7900'	M
Laramie false sagebrush	*Sphaeromeria simplex*	G2/S2	Cushion plant communities on rocky limestone ridges & gentle slopes 7500 to 8600'	M

Sources: USDI-BLM (2002), WYNDD (2003).

1 - Definition of status

G *Global rank: Rank refers to the range-wide status of a species.*

T *Trinomial rank: Rank refers to the range-wide status of a subspecies or variety.*

S *State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.*

1. Critically imperiled because of extreme rarity (often known from 5 or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.

2. Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.

3. Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).

4. Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.

5. Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.

2 – Project Area Occurrence

M- Moderate potential

U- Unlikely to occur

3.6.4 Wetlands

No jurisdictional wetlands exist within the JRPA and the nearest intermittent stream is Fillmore Creek. The location and classification of potential wetlands within the JRPA were determined from a FWS National Wetlands Inventory (NWI) map. Seven types of polygon wetland features (78.8 total acres) and three types of linear wetland features (12,810.7 total feet) are located within the JRPA; most are located along Fillmore Creek. The Cowardin System (Cowardin *et al*. 1979) classifies the wetland types as follows (**Table 3-20**): L2ABGh – Lacustrine, littoral, aquatic bed, intermittently exposed, diked/impounded; PABFh – Palustrine, aquatic bed, semipermanently flooded, diked/impounded; PEMA – Palustrine, emergent, temporarily flooded; PEMC Palustrine, emergent, seasonally flooded; PEMCh – Palustrine, emergent, seasonally flooded, diked/impounded; PEMFh – Palustrine, emergent, semipermanently flooded, diked/impounded; PUSCh – Palustrine, unconsolidated shore, seasonally flooded, diked/impounded; R4SBA – Riverine, intermittent, streambed, temporarily flooded.

Table 3-20
United States Fish and Wildlife Service National Wetland Inventory Classification of Wetlands Present within the JRPA[A]

Wetland Type[B]	Polygon Features			Linear Features		
	Count	Hectares	Acres	Count	Meters	Feet
L2ABGh	1	7.2	17.7	-	-	-
PABFh	3	2.4	5.9	-	-	-
PEMA	1	1.0	2.4	3	990.5	3,249.7
PEMC	5	9.0	22.1	6	2,864.2	9,397.0
PEMCh	4	8.2	20.3	-	-	-
PEMFh	1	3.8	9.4	-	-	-
PUSCh	3	0.4	1.0	-	-	-
R4SBA	-	-	-	1	50.0	164.0
Totals	21	32.0	78.8	10	3,904.7	12,810.7

A Source: FWS NWI data.
B See Cowardin et al. (1979) for classification description. Available at the NWI website: http//www.nwi.fws.gov/Pubs_Reports/public.htm

3.6.5 Noxious and Invasive Weeds

Weed invasion and establishment is minimal in the JRPA. However, this area is vulnerable to invasion of noxious and invasive weed species such as Canada Thistle (*Cirsium arvense*), spotted knapweed (*Centaurea maculosa Lam*.), Russian knapweed (*Centaurea repens L*.), whitetop (*Cardaria draba*), tamarisk or saltcedar (*Tamarix spp*.), and invasive species such as, halogeton (*Halogeton glomeratus*), curlycup gumweed (*Grindelia squarrosa*), annual goosefoot (*Chenopodium*), Russian thistle (*Salsosa iberica*), cheatgrass (*Bromus tectorum L*.), and several annual mustards. These invasive species are normally restricted to disturbed areas.

Any newly disturbed surface (e.g., well pads, pipeline, and road ROWs) within the JRPA will be susceptible to invasive/noxious weed infestations. **Table 3-21** shows the current designated noxious weed list in Wyoming.

Table 3-21
Designated Noxious Weeds in Carbon County, WY

Scientific Name	Common Name
Agropyron repens	Quackgrass
Ambrosia tomentosa	Skeletonleaf bursage
Arctium minus	Common burdock
Cardaria draba, C. pubescens	Hoary cress, whitetop
Carduus acanthoides	Plumeless thistle
Carduus nutans	Musk thistle
Centaurea diffusa	Diffuse knapweed
Centaurea maculosa	Spotted knapweed
Centaurea repens	Russian knapweed
Chrysanthemum leucanthemum	Ox-eye daisy
Cirsium arvense	Canada thistle
Convolvulus arvensis	Field bindweed
Cynoglossum officinale	Houndstongue
Euphorbia esula	Leafy spurge
Isatis tinctoria	Dyers woad
Lepidium latifolium	Perennial pepperweed
Linaria dalmatica	Dalmatian toadflax
Linaria vulgaris	Yellow toadflax
Lythrum salicaria	Purple loosestrife
Onopordum acanthium	Scotch thistle
Sonchus arvensis	Perennial sowthistle
Tamarisk spp.	Salt cedar
Hypericum perforatum	Common St. Johnswort
Tanacetum vulgara	Common tansy

1 Designated Noxious Weeds, Wyoming Stat. § 11-5-102 (a)(xi) and Prohibited Noxious Weeds, Wyoming Stat. § 11-12-104.

In addition to the 24 species listed in Table 3-21, halogeton, plains prickly pear, larkspur, and lupine are declared noxious by Carbon County (Justensen 2004).

3.7 RANGE RESOURCES

3.7.1 Range Resources

The JRPA is located entirely within the Fillmore Allotment (#10609) managed by the BLM RFO in accordance with the Great Divide RMP. The allotment includes 42,335 acres, of which 19,409 acres are on public land (approximately 44 percent) and 22,926 acres of private land (approximately 56 percent). The Fillmore Allotment supports 3,374 animal unit months (AUMs), which includes 3,300 cattle AUMs and 74 horse AUMs. The average stocking rate is 5.75 acres per AUM. A temporary increase in permitted use (up to 25 percent) was granted in 1997 and was monitored for three years. At the end of the three-year period, monitoring indicated that range and resource conditions were maintained to BLM standards. Based on this data, the permittee was granted a permanent 25 percent increase in their AUMs (Newberry 2004b).

The allotment is utilized from May through the end of September. Numerous range improvement projects have been completed for this allotment, which have enhanced range and resource conditions. These improvement projects have included: prescribed burns, fencing, instream structures, spring development, Spike 20P treatments, and small reservoir construction and/or maintenance. Prescribed burns completed in 1994,1995, and 1999 have burned approximately 31 percent of the allotment (BLM 1998). Monitoring of treated sites has shown that with managed post-treatment use, plant densities and overall health of herbaceous vegetation has increased. Continued BLM monitoring of the Fillmore Allotment has rated the condition of the range conditions as good to excellent and utilization is light by livestock (BLM 2003a).

3.8 WILDLIFE

The JRPA is located in the sagebrush steppe plant community that is typical of the high inter-mountain desert of south central Wyoming. The primary vegetation in the JRPA is Wyoming big sagebrush with interspersed mixed grasses. The JRPA includes approximately 3,910.5 acres of sagebrush steppe/mixed grass wildlife habitat. Many common species of birds, mammals, amphibians, and reptiles are found within the JRPA. The survey and analysis area for the greater sage-grouse consisted of the JRPA plus a 2-mile buffer around the JRPA and the pipeline. The survey and analysis area for raptors included the JRPA plus a 1-mile buffer around the JRPA and the pipeline. **Figure 3-1** shows the location of critical wildlife resources located within and close to the JRPA.

Information regarding the potential occurrence of federally threatened or endangered species, species of concern, big game, raptors, and greater sage-grouse near the JRPA was obtained from several sources. Greater sage-grouse lek locations, seasonal big game range designations, and locations for threatened and endangered species were obtained from the Wyoming Game and Fish Department's (WGFD) Wildlife Observation System (WOS), WGFD regional biologists, the BLM, and the WYNDD. WGFD big game herd unit annual reports were used for herd unit population statistics. Previously identified raptor nest locations were obtained from the BLM, RFO.

Existing wildlife information for the JRPA was supplemented through survey data collected by Hayden-Wing & Associates (HWA) biologists between 2001 and 2004. Wildlife surveys performed by HWA from 2001-2003 were conducted as part of larger scale surveys being performed in preparation for the Atlantic Rim EIS. Wildlife field work conducted within the JRPA during 2001 included: (1) a helicopter survey to determine the status of nesting raptors, (2) ground-truthing and mapping of white-tailed prairie dog towns, (3) the identification and mapping of potential mountain plover habitat, and (4) a helicopter survey to locate habitat areas being used by greater sage-grouse during severe winter conditions. Surveys for presence/absence of mountain plover were conducted in potential habitat areas for three consecutive years from 2001-2003. In the spring of 2004, aerial and ground surveys were conducted to locate and determine activity status of greater sage-grouse leks on and within two miles of the JRPA and to locate active raptor nests on and within one mile of the JRPA.

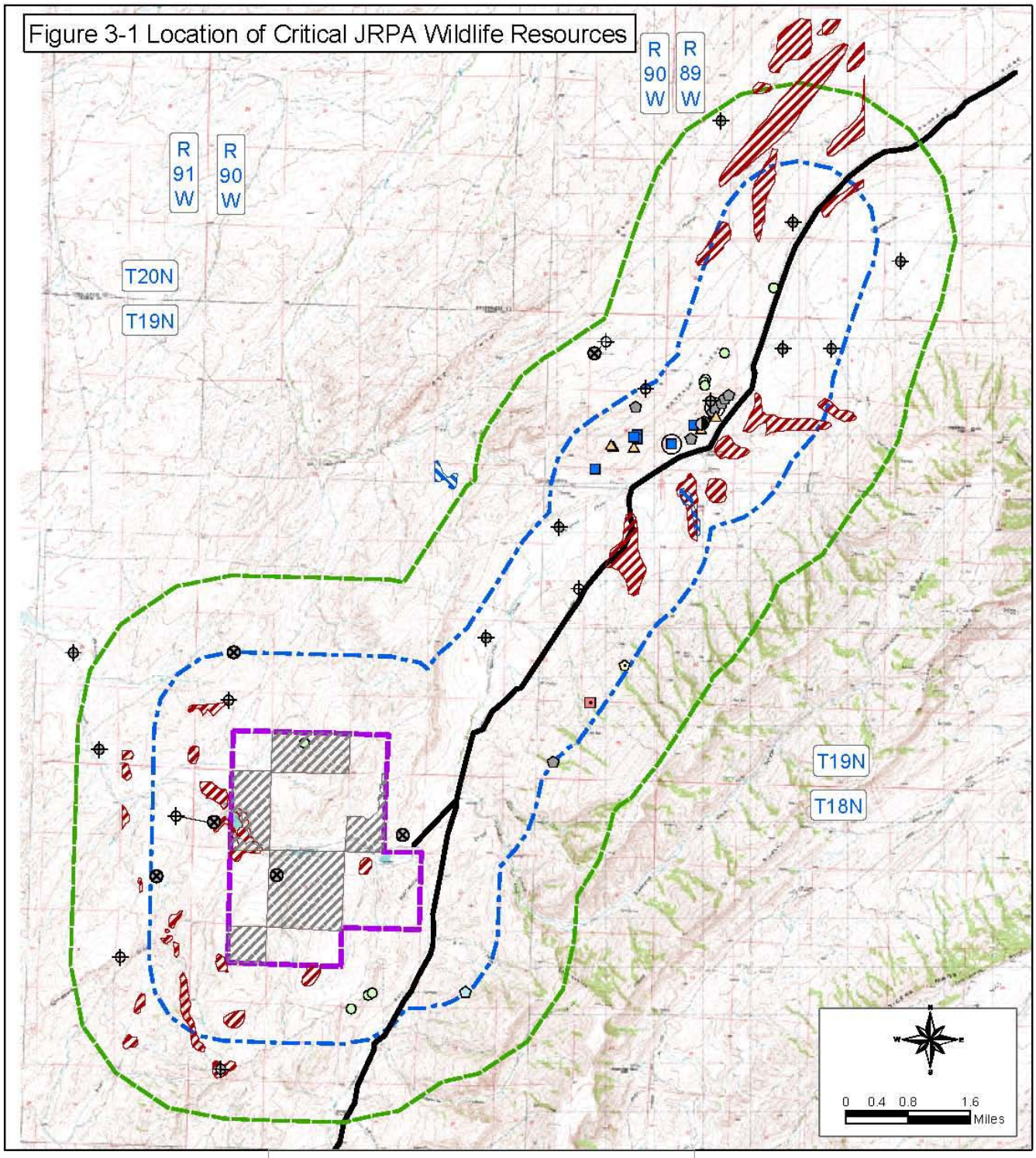


Figure 3-1 Location of Critical JRPA Wildlife Resources
R 91 W
R 90 W
R 90 W
R 89 W
T20N
T19N
T19N
T18N
0 0.4 0.8 1.6
Miles
LEGEND
Jolly Roger POD
Raptor Survey Area
2 Mile Sage Grouse Buffer
Sales Pipeline
Potential Sage Grouse Nesting Habitat on BLM Land within the POD
Raptor Nests
Coopers Hawk
Ferruginous Hawk
Golden Eagle
Northern Goshawk
Prairie Falcon
Red Tailed Hawk
Swainsons Hawk
Unknown Raptor
Active Nest 2004
White-tailed Prairie Dog Towns
Potential Mountain Plover Habitat
Active Sage Grouse Leks
Inactive Sage Grouse Leks
Unknown Sage Grouse Leks

Potential greater sage-grouse nesting habitat on the JRPA was mapped in the spring of 2004. During all surveys conducted by HWA biologists, any observations of threatened, endangered, proposed, or sensitive species were noted. Information regarding the potential occurrence of sensitive species within the JRPA was also obtained from the WYNDD.

3.8.1 Big Game

Three big game species: pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*) utilize the JRPA during the course of a year. Four seasonal ranges, designated by the WGFD, occurring within the JRPA include: crucial winter/yearlong; winter; winter/yearlong; and spring/summer/fall. Crucial big game range (e.g., crucial winter/yearlong range) includes any seasonal range or habitat component that has been documented as a determining factor in a population's ability to maintain itself at a specified level over the long-term. Winter ranges are used by substantial numbers of animals only during the winter months (December through April). Winter/yearlong ranges are occupied throughout the year, but during winter they are used by additional animals that migrate from other seasonal ranges. Spring/summer/fall ranges are used before and after winter conditions end. Areas designated as OUT (or non-use areas) contain habitats of limited importance to the species.

3.8.1.1 Pronghorn

The JRPA is located within the 1,394-square-mile Baggs Pronghorn Herd Unit and contains two types of pronghorn seasonal ranges: winter/yearlong (3,462 acres) and spring/summer/fall (448 acres). Pronghorn likely migrate through the JRPA along several routes as they move to and from spring/summer/fall ranges. The 2002 population estimate for the Baggs Herd Unit was 8,600 animals, which was 4.4 percent below the objective of 9,000 (WGFD 2003a). The JRPA is located within Hunt Area 55, where the hunter success rate for 2002 was 100 percent.

3.8.1.2 Mule Deer

The JRPA is located within the Baggs Mule Deer Herd Unit. The Baggs Herd Unit is very large (3,440 square miles) and contains habitats ranging from subalpine and montane coniferous forests to desert scrub. The JRPA is entirely within winter/yearlong range (3,910 acres) and no mule deer migration routes pass through the JRPA. The 2002 population estimate for the Baggs Herd Unit was 20,500 (WGFD 2003a). This estimate is above the WGFD management objective of 18,700. The JRPA is located within Hunt Area 84; of all the mule deer licenses issued in the Baggs Herd Unit in 2002, only 4.4 percent were issued in Hunt Area 84. The hunter success rate in hunt area 84 in 2002 was 70 percent.

3.8.1.3 Elk

The JRPA is located within the Sierra Madre Elk Herd Unit (2,425 square miles). Most elk in the herd unit utilize spring/summer/fall ranges in the Sierra Madre Mountains, although there are groups using habitats on the ARPA and around McCarty Canyon. During winter, the elk migrate to lower elevation winter range habitats on the west side of the Sierra Madre Mountains and into the ARPA/Sand Hills areas. Some animals may migrate as far west as the Powder Rim (~ 40 miles west of Baggs, WY; Porter 1999). However, no major elk migration routes pass through the JRPA. The majority of the JRPA is classified as elk winter range (3,908 acres) and the extreme southeast corner of Section 9 T18N:R90W is classified as crucial winter/yearlong range

(1.8 acres). Elk winter use of the JRPA may have increased in recent years following controlled burns that have increased the availability of herbaceous vegetation. The 2002 post-hunt season population estimate for the Sierra Madre Herd Unit of 5,300 animals is 26 percent above the WGFD management objective of 4,200 (WGFD 2003a). The JRPA is located within Hunt Area 108, where the hunter success rate for 2002 was 69.8 percent.

3.8.2 Upland Game Birds

3.8.2.1 Greater Sage-Grouse

The JRPA is located within the extensive sagebrush/grassland habitat of southcentral Wyoming where greater sage-grouse are common inhabitants. Strutting grounds (leks), nesting, brood-rearing, and wintering habitats are all important habitat components required by greater sage-grouse (*Centrocercus urophasianus*). Sometimes these habitats are contiguous and other times occur in a patchy, disconnected pattern (Call and Maser 1985). Approximately 50 percent of greater sage-grouse hens usually nest within two miles of leks (Braun *et al*. 1977, Hayden-Wing *et al*. 1986, Wakkinen *et al*. 1992, Wallestad and Pyrah 1974). The greater sage-grouse is not formally listed as a federally threatened or endangered species, but it has been petitioned to be listed under the Endangered Species Act (ESA) and the FWS is currently reviewing the status of the greater sage-grouse. The greater sage-grouse is considered a sensitive species by the BLM in Wyoming.

The JRPA is located within the Sierra Madre upland game management unit area (Area 25). According to the Annual Report of Upland Game and Furbearer Harvest for 2002, 585 greater sage-grouse were harvested in Area 25 providing 643 hunter recreation days (WGFD 2003b). The Sierra Madre Upland Game Management Area accounted for approximately 12.1 percent of the state-wide harvest of greater sage-grouse in 2002.

Surveys to determine greater sage-grouse lek activity were conducted on and within a 2-mile buffer of the JRPA (HWA 2004a). Surveys were conducted in accordance with WGFD protocols obtained from the BLM for use in the 2004 survey season. Surveys included two dawn aerial flights (March 24 and April 1, 2004) over the entire survey area and one ground survey on BLM lands within the survey area. At the request of the landowner, ground surveys were not conducted on private lands within the survey area. Greater sage-grouse locations were recorded using Global Positioning System (GPS) equipment and a USGS topographic map. The number of birds observed was also documented. While traveling between known lek locations, any new lek observations were recorded. Greater sage-grouse lek surveys were also conducted by the BLM and WGFD in the vicinity of the JRPA in the spring of 2004.

Based upon surveys conducted by HWA, WGFD, and BLM in 2004, there were ten active leks, three inactive leks, and six leks with unknown activity status on and within two miles of the JRPA. According to the WGFD, lek #17 (Fillmore Ranch Lek) has two strutting centers and birds have historically been observed strutting on each center alternately and on both centers simultaneously. In 2004, HWA observed males strutting on the west center of the lek, which is located just outside of the JRPA boundary; no grouse were observed on the east center of the lek in 2004. One inactive lek (#14) was located within the JRPA. One active lek was located approximately ¼ mile northwest of the proposed pipeline in Section 23.

The entire JRPA are located within two miles of greater sage-grouse leks and is subject to seasonal restrictions to protect nesting greater sage-grouse. Potential greater sage-grouse nesting habitat on BLM-managed land within the JRPA was mapped in April and May, 2004. Nesting habitat criteria outlined in the Wyoming Greater Sage-Grouse Conservation Plan were used as a guide to map potential nesting habitats. Approximately 43.9 percent (1,714.9 acres) of the JRPA is located on BLM-managed land, and of that area, 88.0 percent (1,509 acres) was considered to be potential greater sage-grouse nesting habitat.

Aerial surveys were conducted by HWA biologists during the winter of 2001 to identify and define ARPA greater sage-grouse concentration areas during the severe winter (HWA 2004b). Those areas of habitat where greater sage-grouse were located during the winter aerial survey were termed severe winter relief habitat. No severe winter relief greater sage-grouse habitat was located within the JRPA in 2001.

3.8.2.2 Raptors

Raptor species that may occur on or near the JRPA and pipeline include golden eagle, bald eagle, northern harrier, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-tailed hawk, Swainson's hawk, rough-legged hawk, ferruginous hawk, American kestrel, merlin, prairie falcon, peregrine falcon, short-eared owl, long-eared owl, great-horned owl, and burrowing owl.

On May 5, 2004, HWA performed aerial and ground surveys to locate and document active raptor nests on and within a 1-mile buffer of the JRPA (HWA 2004c). All active and inactive raptor nests were documented. Previously documented raptor nest locations were obtained from the RFO. Ground surveys were conducted to verify activity status of some of the raptor nests identified from the air and to verify activity status of previously documented nests that were not observed from the air.

Based upon historical BLM data and HWA surveys in 2004, 33 raptor nests were documented within the survey area (HWA 2004c). One inactive ferruginous hawk nest was identified during the BLM onsite review in Section 32. Two active nests (1 golden eagle; 1 red-tailed hawk) were located in Section 7 of T19N:R89W. These nests were located on private land, but were observed from the public access county road (the Twenty Mile Road). These two active nests were located on a cliff less than ¼- mile from the proposed pipeline.

3.8.3 Special Status Species – Wildlife

Special status species include: (1) federally threatened, endangered, and candidate species listing by the FWS (Under the ESA of 1973 as amended). The FWS has determined that five wildlife species listed as either threatened, endangered, or candidate under the ESA may potentially be found on lands administered by the RFO. These species are the threatened bald eagle (*Halieaeetus leucocephalus*), endangered black-footed ferret (*Mustela nigripes*), threatened Canada lynx (*Lynx canadensis*), endangered Wyoming toad (*Bufo baxteri*), and the threatened Preble's meadow jumping mouse (*Zapus hudsonius preblei*). The only federally listed species found on RFO lands potentially occurring in the JRPA are the bald eagle, black-footed ferret, and Canada lynx (USDI-FWS 2003).

3.8.3.1 Threatened and Endangered Species – Wildlife

Black-footed Ferret and Associated White-tailed Prairie Dog Colonies

The black-footed ferret's original distribution in North America closely corresponded to that of prairie dogs (Hall and Kelson 1959, Fagerstone 1987). In Wyoming, white-tailed prairie dog (*Cynomys leucurus*) colonies provide habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food and they also use prairie dog burrows for shelter, parturition, and raising their young (Fagerstone 1987). Aerial surveys of prairie dog colonies were conducted over the JRPA by HWA between March 26 and April 3, 2001. Linear transects (1/4-mile spacing) were flown using a fixed-wing aircraft with GPS capabilities at an average altitude of 200 feet. One small prairie dog colony (2.2 acres) was located within the JRPA. Prairie dogs were observed during the aerial survey in Section 1, T18N:R91W, just west of the JRPA, but the colonies were not mapped because they were on private land. The potential for black-footed ferrets to occur within the JRPA is low due to the lack of suitable habitat. Additionally, the JRPA is located in an area of block clearance established by the FWS and WGFD for the black-footed ferret.

Canada Lynx

Records of lynx in Wyoming indicate that most lynx or lynx sign between 1973 and 1986 were in lodgepole pine (18%) and spruce-fir (41%) communities (Reeve *et al*. 1986). According to Reeve *et al*. (1986), more than 50 percent of lynx records in Wyoming occurred in the northwestern region of the state. No lynx sightings or sign have been documented in Carbon County since the late 1800's (Reeve *et al*. 1986).

Due to the facts that: (1) The JRPA does not include high elevation lodgepole pine/spruce-fir habitat types preferred by this species, (2) it does not support a population of snowshoe hares (preferred prey item), (3) there are no recorded lynx sightings near the JRPA, and (4) the closest potential habitat (lynx analysis unit (LAU)) is more than ten miles away in the Sierra Madre Mountains, it is unlikely that lynx occur on or near the JRPA.

Bald Eagle

Primary bald eagle wintering areas are typically associated with concentrations of food sources along major rivers that remain unfrozen whereby fish and waterfowl are available, and near ungulate winter ranges that provide carrion (Montana Bald Eagle Working Group 1990). Wintering bald eagles are also known to roost in forests with large, open conifers and snags protected from winds by ridges, often near concentrations of domestic sheep and big game (Anderson and Patterson 1988).

Incidental sightings of bald eagles have been recorded on and near the JRPA (WGFD 2003c). Two observations of bald eagles were recorded within the JRPA on October 21, 1992 and within one mile of the JRPA on January 18, 1984 (WGFD 2003c). No bald eagle nests or communal winter roosts are known to exist on or near the JRPA. Inspection of BLM and WGFD raptor nest records, and results of aerial and ground raptor nest surveys conducted by HWA, reveal that no bald eagle nests occur on or near the JRPA. It is possible that bald eagles may utilize the JRPA for foraging during winter and early spring, feeding on winter killed big game such as mule deer.

3.8.4 Species of Concern – Wildlife

The BLM has developed a sensitive species list for their lands managed in Wyoming. The objective of the sensitive species designation is to ensure the overall welfare of these species is considered when undertaking actions on public lands, and ensure they do not contribute to the need to list the species under the provisions of the ESA. It is the intent of this policy to emphasize the inventory, planning consideration, management implementation, monitoring, and information exchange for the sensitive species on the list. The BLM Sensitive Species List is meant to be dynamic and will be reviewed annually with recommendations from BLM biologists and appropriate non-BLM authorities for additions and deletions (USDI-BLM 2002). Twenty-eight species (6 mammals, 15 birds, 3 amphibians, and 4 fish) occur on the RFO Sensitive Species List. **Table 3-22** lists the species of concern potentially occurring in the JRPA.

Mammals

Six sensitive mammal species may potentially be found on or near the JRPA. These include: Wyoming pocket gopher, white-tailed prairie dog, swift fox, fringed myotis, long-eared myotis, and Townsend's big-eared bat. Only one of these species, the white-tailed prairie dog is known to occur within the JRPA; one small town (2.2 acres) occurs in Section 6, T18N:R90W. The remaining species: Wyoming pocket gopher, swift fox, fringed myotis, long-eared myotis, and Townsend's big-eared bat have a slight potential to occur on the JRPA.

Birds

Sixteen sensitive bird species may potentially be found on or near the JRPA. These include: mountain plover, Baird's sparrow, sage sparrow, Brewer's sparrow, long-billed curlew, sage thrasher, western burrowing owl, yellow-billed cuckoo, loggerhead shrike, Columbian sharp-tailed grouse, greater sage-grouse, white-faced ibis, trumpeter swan, peregrine falcon, ferruginous hawk, and northern goshawk. The western subspecies of yellow-billed cuckoo is considered a FWS candidate for listing as endangered. Eight of these species are known to be present or are likely to occur in the area of the JRPA and include: sage sparrow, Brewer's sparrow, sage thrasher, western burrowing owl, loggerhead shrike, greater sage-grouse, ferruginous hawk, and northern goshawk (not likely to nest on the JRPA, though). Six species: mountain plover, Baird's sparrow, Columbian sharp-tailed grouse, peregrine falcon, long-billed curlew, and white-faced ibis have a slight potential to occur on or near the JRPA. The yellow-billed cuckoo and trumpeter swan are unlikely to occur on or near the JRPA.

Mountain plovers prefer shortgrass prairie and desert shrub habitats (e.g. saltbush) with open, level or slightly rolling areas and vegetation under four inches in height (Graul 1975, Dinsmore 1981, Dinsmore 1983, Kantrud and Kologiski 1982). The JRPA was surveyed for potential mountain plover habitat in May, 2001 by HWA biologists. Areas with potential habitat for mountain plover were identified on the ground and mapped on 1:24,000 scale topographic maps. Additional surveys were conducted on potential habitat areas within the JRPA in the spring of 2001, 2002, and 2003. Surveys followed the 2001 Mountain Plover Survey Protocol developed by the RFO and the FWS. Three patches, totaling 113.3 acres, of potential mountain plover habitat were located within the JRPA boundary. The proposed pipeline would cross one patch of potential mountain plover habitat totaling 167 acres. No mountain plovers were sighted on the JRPA or along the pipeline during any of the surveys. However, HWA did locate a mountain

plover with young 20 miles north of the JRPA in 2004. Also, during on-site visits of the well locations, BLM biologists identified potential mountain plover habitat on a site specific basis.

Amphibians

Three sensitive amphibian species may potentially be found on or near the JRPA. These include: boreal toad, Great Basin spadefoot toad, and northern leopard frog. All three species have a slight potential to occur on the JRPA.

Fish

No fish are found in the JRPA due to lack of any perennial streams.

Table 3-22
Sensitive Wildlife and Fish Species Potentially Present on or near the JRPA

Common Name	Scientific Name	Sensitivity Status[2]	Occurrence Potential[3]
Mammals			
Wyoming pocket gopher	*Thomomys clusius*	R2, G2/S1S2, NSS4	Possible
White-tailed prairie dog	*Cynomys leucurus*	G4/S2S3, NSS3	Present
Swift fox	*Vulpes velox*	R2, G3/S2A3	Possible
Fringed myotis	*Myotis thysanodes*	R2, G5/S1B, S1N, NSS2	Possible
Long-eared myotis	*Myotis evotis*	G5/S1B, S1?N, NSS2	Possible
Townsend's big-eared bat	*Corynorhinus townsendii*	R2/R4, G4/S1B, S2N, NSS2	Possible
Birds			
Mountain Plover	*Charadrius montanus*	G2/S2B, SZN	Possible
Baird's sparrow	*Ammodramus bairdii*	G4/S1B, SZN, FSR2, TBNG	Possible
Sage sparrow	*Amphispiza belli*	G5/S3B, SZN	Present
Brewer's sparrow	*Spizella breweri*	G5/S3B, SZN	Present
Long-billed curlew	*Numenius americanus*	G5/S3B, SZN, R2, NSS3	Possible
Yellow-billed cuckoo	*Coccyzus americanus*	G5/S2B, SZN, FSR2, TBNG, NSS2	Unlikely
Sage thrasher	*Oreoscoptes montanus*	G5/S3B, SZN	Likely
Western burrowing owl	*Athene cunicularia*	R2, G4/S3B, SZN, NSS4	Likely
Loggerhead shrike	*Lanius ludovicianus*	G5/S4B, SZN, R2	Likely
Columbian sharp-tailed grouse			Possible
Greater sage-grouse	*Centrocercus urophasianus*	G5/S3	Present
White-faced ibis	*Plegadis chihi*	G5/S1B, SZN, R2, NSS3	Possible
Trumpeter swan	*Cygnus buccinator*	R2/R4, G4/S1B, S2N, NSS2	Unlikely
Peregrine falcon	*Falco peregrinus*	G4/T3/S1B, S2N, R2, NSS3	Possible
Ferruginous hawk	*Buteo regalis*	R2, G4/S3B, S3N, NSS3	Present

Common Name	Scientific Name	Sensitivity Status[2]	Occurrence Potential[3]
Northern goshawk	*Accipiter gentiles*	R2/R4, G5/S23B, S4N, NSS4	Likely
Amphibians			
Boreal toad	*Bufo boreas boreas*	G4T4/S2, R2, R4, NSS2	Possible
Great Basin spadefoot Toad	*Spea intermontanus*	G5/S4, NSS4	Possible
Northern leopard frog	*Rana pipiens*	G5/S3, R2, NSS4	Possible
Fish			
Roundtail chub	*Gila robusta*	G2G3/S2?, NSS1	Unlikely
Bluehead sucker	*Catostomus discobolus*	G4/S2S3, NSS1	Unlikely
Flannelmouth sucker	*Catostomus latipinnis*	G3G4/S3, NSS1	Unlikely
Colorado River cutthroat Trout	*Oncorhynchus clarki pleuriticus*	R2/R4, G4T2T3/S2, NSS2	Unlikely

[1] *- Source: USDI-BLM (2002), WYNDD (2003).*
[2] *- Definition of status*

***G** Global rank: Rank refers to the range-wide status of a species.*
***T** Trinomial rank: Rank refers to the range-wide status of a subspecies or variety.*
***S** State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.*
***1** Critically imperiled because of extreme rarity (often known from 5 or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.*
***2** Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.*
***3** Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).*
***4** Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.*
***5** Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.*
***H** Known only from historical records. 1950 is the cutoff for plants; 1970 is the cutoff date for animals.*
***X** Believed to be extinct.*
***A Accidental or vagrant**: A taxon that is not known to regularly breed in the state or which appears very infrequently (typically refers to birds and bats).*
***B Breeding rank:** A state rank modifier indicating the status of a migratory species during the breeding season (used mostly for migratory birds and bats)*
***N Nonbreeding rank**: A state rank modifier indicating the status of a migratory species during the non-breeding season (used mostly for migratory birds and bats)*
***ZN or ZB** Taxa that are not of significant concern in Wyoming during breeding (ZB) or non-breeding (ZN) seasons. Such taxa often are not encountered in the same locations from year to year.*
***U** Possibly in peril, but status uncertain; more information is needed.*
***Q** Questions exist regarding the taxonomic validity of a species, subspecies, or variety.*
***?** Questions exist regarding the assigned G, T, or S rank of a taxon.*
***R2** Designated sensitive in U.S. Forest Service Region 2 (Rocky Mountain Region).*
***R4** Designated sensitive in U.S. Forest Service Region 4 (Intermountain Region).*

WGFD Native Species Status Codes - Fish and Amphibians
***NSS1** - Populations are physically isolated and/or exist at extremely low densities throughout range. Habitats are declining or vulnerable. Extirpation appears possible. The Wyoming Game and Fish Commission mitigation category for Status 1 species is "Vital". The mitigation objective for this resource category is to realize "no loss of habitat function". Under these guidelines, it will be very important that the project be conducted in a manner that avoids alteration of habitat function.*
***NSS2** - Populations are physically isolated and/or exist at extremely low densities throughout range. Habitat conditions appear to be stable. The Wyoming Game and Fish Commission mitigation category for Status 2 species is also "Vital". The mitigation objective for this resource category is to realize "no loss of habitat function". Under these guidelines, it will be very important that the project be conducted in a manner that avoids alteration of habitat function.*
***NSS3** - Populations are widely distributed throughout its native range and appear stable. However, habitats are declining or vulnerable. The Wyoming Game and Fish Commission mitigation category for Status 3 species is "High". The mitigation objective for this resource category is to realize "no net loss of habitat function within the biological community which encompasses the project site". Under these guidelines, it will be important that the project be*

conducted in a manner that either avoids the impact, enhances similar habitat or results in the creation of an equal amount of similarly valued fishery habitat.
***NSS4-7** - Populations are widely distributed throughout native range and are stable or expanding. Habitats are also stable. There is no special concern for these species.*

WGFD Native Species Status Codes - Birds and Mammals
***NSS1** - Populations are greatly restricted or declining, extirpation appears possible. AND On-going significant loss of habitat.*
***NSS2** - Populations are declining, extirpation appears possible; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance. OR Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.*
***NSS3** - Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance. OR Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance. OR Species is widely distributed; population status or trends are unknown but are suspected to be stable; on-going significant loss of habitat.*
***NSS4** - Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance. OR Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance.*
***NSS5** - Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is stable and not restricted. OR Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance.*
***NSS6** - Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is stable and not restricted.*
***NSS7** - Populations are stable or increasing and not restricted in numbers and/or distribution; habitat is stable and not restricted.*

[3] - Occurrence potential based upon presence of suitable habitat, known distribution, WYNDD records, WGFD records, and field surveys.

3.9 RECREATION

Popular recreational activities commonly pursued on or near the JRPA include hunting, camping, and off-road vehicle use. There are no developed recreational sites, facilities, or special recreational management areas within or adjacent to the JRPA. The fall hunting season attracts the majority of recreational use. The greater sage-grouse season in September and October attracts small game hunters. In addition, pronghorn hunting also occurs in September and mule deer hunting occurs in mid to late October. Rabbits and some predators are hunted during the fall and winter. Outside designated hunting seasons, a small number of visitors are attracted to this area for other recreational activities. These activities include: hiking, wildlife viewing and sightseeing, rock collecting, outdoor photography and picnicking. Data on recreational visitation are not available. A variety of factors, such as small number of local residents, long distances from major population centers, lack of publicized natural attractions, road conditions, and checkerboard land ownership patterns limit access to the area. These factors have resulted in low visitation to the JRPA.

3.10 VISUAL RESOURCES

The objective of BLM visual resource management is managing and protecting visual resource values in accordance with Section 102(a) (8) of the Federal Land Policy and Management Act of 1976. The rating of visual resource values takes into consideration scenic qualities, sensitivity levels, and a delineation of distance zones.

The JRPA is located in a BLM visual resource management Class III area, which is managed to partially retain the existing character of the landscape. Management activities taking place in this class may modify the landscape, but should not dominate the views.

Views in the JRPA are enhanced by the open, treeless, and hilly topography. Ridges and high points allow the observer a view that stretches for miles across the vast JRPA. These views encompass distant ridges with some timber, ranch dwellings, and drainages.

Vegetation in the JRPA is typical for this part of Wyoming, consisting mostly of low sagebrush and grasses, with the drainages containing some larger sagebrush and rabbitbrush. These plant communities provide different colors throughout the seasons. If precipitation is ample, the spring green provides a striking contrast to the grey sagebrush of winter. Late summer and fall grasses turn to rust and brown as the growing season ends. The seasonal changes in vegetation color are noticed by the casual observer, and are enhanced by the ability to view long distances in the JRPA.

Some cultural modification has occurred in the JRPA, consisting of the Fillmore Ranch and unimproved roads. Some oil and gas wells can also be viewed in the area. Twentymile Road is the only public access into the area, and motorists traveling along this route would be able to view the JRPA.

3.11 CULTURAL RESOURCES

3.11.1 Cultural Chronology of Area

Archaeological investigations in the Washakie Basin indicate the area has been inhabited by prehistoric people for at least 10,000 years from Paleoindian occupation to the present. The accepted cultural chronology of the Washakie Basin is based on a model for the Wyoming Basin by Metcalf (1987) and revised by Thompson and Pastor (1995). The Wyoming Basin chronology is documented in **Table 3-23**.

Table 3-23
Prehistoric Chronology of the Wyoming Basin

Period	Phase	Age (B.P.)
Paleoindian		12,00-8,500
Early Archaic	Great Divide	8,500-6,500
	Opal	6500-4300
Late Archaic	Pine Spring	4300-2800
	Deadman Wash	2800/1800-650
Late Prehistoric	Uinta	2000/1800-650
	Firehole	650-300/250
Protohistoric		300/250-150

from Metcalf (1987), as modified by Thompson and Pastor (1995)

Paleoindian Period

The oldest period for which there is solid archaeological evidence is the Paleoindian, beginning ca. 12,000 B.P. and ending around 8500 B.P. This is the transition period from the periglacial conditions of the Wisconsin ice advance during the terminal Pleistocene to the warmer and drier conditions of the Holocene. Paleoindian sites are rare in southwest Wyoming. However, isolated Paleoindian projectile points are not uncommon.

Archaic Period

Settlement and subsistence practices, in southwest Wyoming, remained largely unchanged from the end of the Paleoindian period through the Archaic and continued until at least the introduction of the horse. Reduced precipitation and warmer temperatures changed the environment. The Archaic Period dates from 8,500 B.P to 2,000 B.P. The Archaic period is divided into early and late periods. The early periods are the Opal and Great Divide. The late period is divided into the Pine Spring and Deadman Wash phases. These periods are characterized by a greater use of plant material.

Late Prehistoric Period

The late Prehistoric period is divided into the Uinta and Firehole phases. This period is highlighted by the increase in seed processing and the introduction of the bow. A unique characteristic of the Uinta phase is the use of subterranean structures dating to ca. 1500 B.P.

Protohistoric Period

The Protohistoric period begins sometime after 300 years B.P. with the first European trade goods to reach the area, and end with the development of the rocky Mountain fur trade 150 years ago. The most profound influence on native cultures during this period was the introduction of the horse, which allowed Native Americans to expand their range.

Historic use of the area was limited by the formidable topography and harsh weather. Some grazing occurred and is recognized by some isolated ranch dwellings. However, historic trails were utilized near the JRPA. The Rawlins to Baggs Stage Road is located near the JRPA and was utilized for moving freight, mail, and passengers between Rawlins, Baggs, and into Colorado. The route was first utilized in 1881 and was known as the Rawlins to White River, the Rawlins, and the Snake River Road (BLM 2004). Stage stations were established along the route, and included service to ranching communities in the Little Snake River Valley.

3.11.2 CULTURAL RESOURCE SUMMARY

A Class 1 Wyoming State Historic Preservation Office (SHPO) file search was completed for the JRPA. A total of six previous field surveys (Class III Intensive Survey) have been completed within or close to the JRPA, resulting in the identification of five sites. All of these sites were either not eligible or had unkown status with regards to eligibility for the NRHP.

3.11.3 JOLLY ROGER PROJECT CULTURAL RESOURCE SURVEY RESULTS

The Class III Intensive Survey identified 5 cultural resource sites in the JRPA. These sites included two sheep herder camps, two lithic scatter sites, and a sheep herder cairn. None of these sites were identified as eligible for the NRHP.

3.12 SOCIOECONOMICS

The geographic area of analysis for potential socioeconomic effects is Carbon County, Wyoming, and the nearest communities of Baggs, Dixon, and Rawlins. Socioeconomic conditions in Carbon County that were characterized for the assessment include economic and population conditions, temporary housing resources, certain local and state government revenues, and local attitudes and opinions.

3.12.1 Economic Conditions

The economy of Carbon County is based on natural resources. Basic economic sectors that bring revenues in the county include: oil and gas extraction and processing, coal mining, electric power generation, agriculture (primarily ranching and logging), some manufacturing, and transportation (primarily the Union Pacific railroad). Those portions of the retail and service sectors that serve tourism and recreation visitors are also basic.

Employment and earnings are two common measures of economic activity. The mining sector, which includes oil and gas employment, would be the primary sector affected by exploration or development of CBNG resources.

Employment, like the overall economy, has followed a boom and bust cycle. In 2002, employment in Carbon County totaled 12,392 full-and part-time jobs, which was about 25 percent higher than the 1990 level (Wyoming Department of Administration and Information [WDAI] 2000a, WDAI 2003) and about 9 percent lower than the 1980 level of 13,350 jobs. Employment in the mining sector, which includes jobs in the oil and gas industry, decreased 73 percent from 1990 to 2001, from 934 to 256 jobs. The 2001 level was 93 percent lower than the 1980 level of 3,563 mining jobs (University of Wyoming [UW] 1997). The losses in the mining sector and the volatility in total employment are attributed to the shutdown of the Rosebud and Seminoe #2 mines (BLM 1999). Recently, the RAG Shoshone mine near Hanna has closed (Rawlins Daily Times 2000). Other reductions in the mine workforce and the delay in opening an anticipated mine have further affected employment in the mining sector throughout the county; however, increases in natural gas drilling has resulted in employment growth in the region in recent years.

In Carbon County, 10-year unemployment rates ranged from a low of 4 percent (2000) to a high of 6.1 percent (1993). The total 2002 labor force in Carbon County was 8,038, which included 366 unemployed persons, resulting in an unemployment rate of 4.6 percent (Wyoming Department of Employment 2003).

Carbon County tax earnings increased from 202 million to 211 million between 1990 and 1998, a 5 percent increase. However, when adjusted for inflation, earnings in Carbon County decreased by 21 percent from their 1990 level during the 8-year period.

3.12.1.1 Oil and Gas Activities

Production of natural gas in Carbon County increased from 76 million cubic feet (MCF) in 1995 to almost 98,100,000 MCF in 2002. In addition, 2002 production of oil in Carbon County was 1,714,000 BBLS. During 2002, there were 1,191 producing oil and gas wells in Carbon County (WOGCC 2002).

One indicator of future production, approved APDs, increased steadily in Carbon County in recent years, from 50 in 1995, 162 in 2000, 280 in 2003, and 151 to date in 2004 (WOGCC 2004). Increased drilling may result in increased production in the county if drilling efforts are successful and commodity prices rise or stabilize at economic levels.

3.12.1.2 Economic Activities

Other economic activities occurring in and near the JRPA include: oil and gas exploration, cattle grazing, and outdoor recreation such as hunting (pronghorn antelope, mule deer, elk and upland birds), hiking, off-road vehicle use, camping, and sightseeing. There are 15 commercial hunting outfitters that hold permits for the hunting units (elk hunt area 108, deer hunt area 84, and antelope hunt area 55) located in the JRPA. The JRPA makes up only a small portion of these hunting units (Wyoming Board of Outfitters 2004).

3.12.1.3 Population

The growth and decline in the population of Carbon County parallel the employment boom and bust cycle outlined at the beginning of this section. For example, the 2000 population of Carbon County (15,639) was 29 percent lower than its 1980 level of 21,896 (WDAI 2001). Between 1990 and 2000, the City of Rawlins, the largest community in Carbon County, lost an estimated 842 persons to end the period at 8,538 (Table 3-23). However, the city has recently added population because a new state prison opened. During this period, the Town of Baggs gained 76 residents or 28 percent of its 1990 population. Likewise, the Town of Dixon, several miles east of Baggs, gained 12 persons to end the period with an estimated population of 79. The largest population centers in Carbon County are listed in **Table 3-24**

Table 3-24
Population Centers

		Population		
County	**City**	**1990**	**2000**	**% Change**
Carbon	Rawlins	9,380	8,538	-9.0
	Saratoga	1,969	1,726	-12

3.12.2 Temporary Housing Resources

Natural gas development typically involves relatively short-duration tasks carried out primarily by contractors. The nature of these activities results in demand for temporary housing resources such as motel rooms, mobile homes, and recreational vehicle (RV) spaces in the JRPA and vicinity.

The most convenient access to the JRPA would be from communities located along I-80 in Carbon and Sweetwater Counties. Rawlins is the county seat of Carbon County and the community nearest to the JRPA. Temporary housing includes 20 hotels and four RV parks. Hotels and RV parks routinely accommodate oil and gas industry workers, as well as tourists, travelers, and hunters. Long-term rental housing in the Rawlins area consists of 10 apartment complexes and numerous rental houses. According to the 2000 Census, 17.3 percent, or 667 housing units, of the total 3,860 housing units were rental vacancies.

3.12.3 Local Government and State Government Revenues

The fiscal condition of local and state governments most likely to be affected by interim drilling includes: County, school, and special district ad valorem property tax revenues; state, county, and municipal sales and use tax revenues; state severance taxes; and federal and state mineral royalty distributions. Some county, municipal, and special district service expenditures may also be minimally affected.

3.12.3.1 Ad Valorem Property Tax

The assessed valuation in Carbon County for fiscal year (FY) 2003 totaled about $382 million, which yielded total property tax revenues of $24.5 million. Mineral production is assessed at 100 percent of value. The countrywide mill levy (including countywide and special districts) in 2003 was 4.9 million. Assessed valuation in FY 2003 from 2002 natural gas production totaled $198.9 million, or about 88 percent of total assessed valuation. Assessed valuation from oil production totaled $30.5 million, or about 13 percent of total assessed valuation (Wyoming Tax Payers Association [WTA] 2003).

3.12.3.2 Sales and Use Tax

FY 2003 sales and use tax collections in Carbon County totaled about $14.5 million. These collections include a 4 percent state sales tax, and a 1 percent general purpose local-option sales tax (WTA 2003)

3.12.3.3 Severance Taxes

In Wyoming, severance taxes are levied against certain minerals produced in the state, including a 6 percent severance tax on natural gas. In FY 2003, distributions from the severance tax totaled $429 million (WDAI 2004).

3.12.3.4 Federal Mineral Royalties

The federal government collects a 12.5 percent royalty on oil and natural gas extracted from federal lands. After certain costs are deducted, half of those royalties are returned to the state where production occurred. In Wyoming, the state's share is distributed to a variety of accounts, including the university, school foundation fund, highway fund, Legislative Royalty Impact Account, and cities, towns, and counties. During FY 2003, $476 million in federal mineral royalty funds were distributed to entities in Wyoming (WDAI 2004).

3.12.3.5 State Mineral Royalties

The State of Wyoming collects a 16.7 percent royalty on the fair market value of gas produced from state leases, less production, and transportation costs. During FY 2003, income from state leasing was 52 million (WDAI 2004).

3.12.4 Attitudes and Opinions

A 1996 survey conducted in conjunction with preparation of the Carbon County Land Use Plan provides some insight into the attitudes and opinions of residents regarding land use, oil and gas development, natural resource conservation, and use and other topics. Slightly more than 300 residents completed the survey, yielding an estimated statistical reliability of about 95 percent (Pederson Planning Consultants 1998). Water resource conservation and concern for government regulation of land use were the most frequently listed important land use issues. This issue was followed closely by the availability of water to support future land uses; the economic viability of ranching, timber, and oil and gas industries; and the need to conserve wildlife habitat.

Approximately 55 percent of the countywide survey respondents (based on a weighted average; some respondents indicated more than one response) indicated that conservation of land, water, and wildlife resources was more important than increased oil and gas production, while 36.9 percent indicated that increased oil and gas production was more important. However, 54 percent of the respondents from Baggs indicated that increased oil and gas production was more important than conservation of land, water, and wildlife resources, while 36 percent indicated that resource conservation was more important. The land use plan attributes the difference to the greater economic dependence in Baggs on future employment in the oil and gas industry.

Concerning management of federal lands, the largest number of respondents (69.5 percent) indicated that more federal lands within the county should be designated for conserving fish and wildlife habitat and water resources. In addition, 60.8 percent of respondents indicated that more land should be designated for public recreation, 48.8 percent indicated that more land should be leased for oil and gas industry exploration and production, 48.7 percent indicated that more land should be leased for commercial mining, and 44.5 percent indicated that more land should be made available to local timber companies for commercial timber harvest.

3.13 TRANSPORTATION

The regional transportation system that serves the JRPA includes an established network of interstate and state highways and county roads. Improved and unimproved BLM roads serve local traffic on federal land. The JRPA would be accessed from Carbon County Road (CCR) 605 (Twentymile Road), which connects I-80 on the west side of Rawlins. CCR 605 is a one-lane road that is graded and partially graveled.

3.14 HEALTH AND SAFETY

Health and safety concerns include occupational hazards associated with natural gas operations. Two types of workers are employed in oil and gas fields: oil and gas workers, who had a 2002 non-fatal accident rate of 3.8 per 100 workers, and special trade contractors, who had a 2002

non-fatal accident rate of 7.4 per 100 workers (U.S. Department of Labor, Bureau of Labor Statistics 2002). In addition to occupational hazards associated with gas operations and exploration, there are health and safety risks associated with vehicular travel on improved and unimproved county and BLM roads; firearms accidents associated with hunting or casual use of firearms; and low-probability events such as landslides, flash floods, and range fires.

3.15 HAZARDOUS WASTE

Bureau of Land Management Instruction Memoranda Numbers WO-93-344 and WY-94-059, require all NEPA documents to list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a Proposed Action. Hazardous materials, as defined herein, are those substances listed in the EPA's Consolidated List of Chemicals Subject to reporting Under Title III of the SARA of 1986, and extremely hazardous materials are those identified in the EPA's List of Extremely Hazardous Substances (40 CFR 355). No hazardous substance, as defined by the CERCLA, will be used in the construction or drilling operations associated with these wells. Additionally, no RCRA hazardous wastes will be generated by well-drilling operations.

3.16 NOISE

The JRPA is located in a rural setting, which is sparsely populated. The only noise created above normal background levels is created by nearby drilling, a compressor station, and localized vehicular traffic on roads can also cause sound disturbances within the JRPA.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter analyzes the potential environmental consequences that would result from implementation of the Proposed Action and the No Action Alternative. The analysis of environmental consequences for each resource potentially affected by exploration and interim development in JRPA are addressed in this section. Additionally, resource specific mitigation measures required by the BLM are outlined in this chapter. The chapter also addresses cumulative impacts that may result from past, present, and reasonably foreseeable future activities (RFFAs) within the JRPA.

An environmental consequence or impact is defined as a change or modification in the existing environmental conditions resulting from implementation of the Proposed Action. Impacts can result directly from the Proposed Action, or can be a secondary or indirect result of the project. Additionally, impacts can vary in the duration they affect the environment, they can be permanent or long lasting (long-term) or temporary (short-term).

Long-term impacts are changes to the affected environment occurring during construction or operation of the project that last longer than two years and potentially for the life or beyond the life of the project. Short-term impacts normally occur during the construction and start-up phase of the project. These impacts usually last two years or less and can be mitigated successively if proper management is applied.

4.2 GEOLOGY, MINERALS, AND PALEONTOLOGY

4.2.1 Alternative 1- Proposed Action

Use of cut and fill construction techniques to develop well locations, access roads, and facilities would alter existing topography. An approximate 145.05 acres of short-term and 57.7 acres of long-term impacts would be affected by surface-disturbing activities in the JRPA.

No major landslides or other geologic hazards have been mapped within the JRPA. By following prescribed procedures, construction would not be likely to activate landslides, mudslides, debris flows, or slumps. Seismic activity is low in the area, so the potential for an earthquake to damage project facilities is minimal.

Drilling the wells in the JRPA is expected to result in the discovery of additional Mesaverde coal CBNG resources. An economic discovery in the JRPA, in conjunction with other economic discoveries under the Interim Drilling Policy, could lead to full-scale development, which is currently being analyzed in the Atlantic Rim EIS. No other major mineral resources would be affected by the proposed project.

It is not anticipated that development of the project would affect any sensitive geologic resource area, such as paleontological sites. Although the surface-disturbing activities associated with the proposed project could disturb paleontological resources, the potential for recovery of important vertebrate fossils in the JRPA is considered low to moderate. Excavation associated with

development of access roads, well pads, gas and water pipelines, and related gas production and water disposal facilities could directly expose, damage, or destroy scientifically significant fossil resources. However, no occurrences of paleontological resources are documented in the JRPA. Mitigation measures discussed in Chapter 2 would protect potential paleontological resources that may be inadvertently uncovered during excavation.

4.2.2 No Action Alternative

Under the No Action alternative, ongoing natural gas production activities would be allowed to continue. However, no exploratory wells would be authorized in the JRPA.

4.3 AIR QUALITY

4.3.1 Alternative 1- Proposed Action

Minor air quality impacts may result from activities initiated in the JRPA. Emission sources connected to the JRPA would be particulate emissions from construction activities and road use, gas production, and vehicle emissions. However, the small number of exploratory wells and facilities present in the JRPA would generate only a small amount of air pollutants. Some temporary effects on air quality would likely occur in the immediate vicinity of the project, caused by particulate matter and exhaust from vehicles and equipment. These effects would be local and would be dispersed by prevailing winds. Temporary increases in dust may also occur during the construction phase of the project. These effects on air quality would be minimized through dust abatement practices.

Prior to wells going into operation, the proponents would be required to file an application with the WDEQ for an air quality permit for oil and gas production facilities under Section 21 of the Wyoming Air Quality Standards and Regulations.

Air emissions would occur from construction and production of gas wells within the JRPA. Emissions from construction would include PM_{10}, SO_2, NO_x, CO, and volatile organic compounds (VOCs) from ground clearing, use of heavy equipment, drilling, and well completion, as well as from construction of access roads. Emissions from construction are temporary and would not contribute significant emissions to the project area and region.

Production emissions of NO_x, CO, VOCs, and hazardous air pollutants (HAPs) (specifically formaldehyde) would result primarily from operation of compressor engines. Estimated impacts to air quality assumed that the average potential emission rate of NO_x from the compressor engines would be approximately 2 grams per horsepower-hour (g/hp-hr) of operation. This rate reflects emission control levels that have already been required in similar applications. The emissions generated from operation of the compressors would contain minimal amounts of sulfur dioxide and particulate matter. Production emissions from the compressor engines would occur over the life of the project.

Pollutant emissions from construction and operation of natural gas fields near the JRPA have been most recently analyzed by the BLM in the Desolation Flats EIS. This study conducted detailed air quality modeling for 592 natural gas wells being planned for the project. The results of the study indicated that no adverse impacts would occur to air quality as a result of the

specific Proposed Action. However, the study did determine the project emissions combined with other regional emission sources would contribute to far-field visibility reduction within regionally designated Class 1 areas. Additionally, localized increases in criteria pollutants would occur as a result of the project. None of these increases would raise concentrations close to federal and state standards for these pollutants.

The emissions associated with this project would be similar to other natural gas projects in Wyoming, but due to the size of the project (only 24 wells); emissions would be on a much smaller scale. Based on the low emissions, no ambient air quality standards would be violated and no significant impacts to air quality would occur as a result of the project. However, JRPA emissions would contribute to regional emissions that contribute to far-field visibility reduction in Class 1 and II areas. However, this contribution would be negligible when compared with large regional emission sources. Additional air quality studies are needed to determine the contribution of southwest Wyoming natural gas operations to regional air quality issues.

4.3.2 No Action Alternative

Under the No Action alternative, no new gas wells would be installed in the JRPA. No new emission sources would occur in the JRPA.

4.4 SOILS

4.4.1 Alternative 1- Proposed Action

The proposed construction and operation of wells and facilities could affect the productivity of soils in the JRPA by:

- Removing existing vegetation cover;
- Redistributing or removing all or part of the soil profile;
- Compacting soils;
- Exposing soil to accelerated wind and water erosion;
- Potentially covering adjacent soils and drainages with sediments;
- Exposing the soil to noxious and invasive weed infestation; and
- Potential damage to sensitive biological soil crusts.

Project activities would reduce soil productivity within and immediately adjacent to the proposed areas of disturbance. The effects of these activities on soil productivity have been evaluated based on their duration, magnitude, and intensity. Both long-term and short-term effects on soil productivity would occur under the Proposed Action. Approximately 145.05 acres would be affected in the short term (2 years or less) and 57.7 acres would be affected in the long term (greater than 2 years).

Vegetation and soil would be removed from well pads, compressor pads, discharge facilities, pipelines, roads, and other facilities. This soil and vegetation removal may result in erosion, as most of the soils present in the JRPA do exhibit the potential for moderate to severe erosion.

As a result of these activities, the productivity of soils could decline due to:

- Reduced soil microbial activity and soil fertility;
- Interruption of soil nutrient and organic matter from vegetation;
- Impaired water infiltration from soil compaction;
- Mixing of soil horizons and soils of differing chemistry/composition;
- Damage to sensitive biological crusts; and
- Top soil loss

The intensity of these effects would vary according to the type and location of disturbance, development and production activities, use of mitigation measures, and the length of disturbance prior to reclamation.

To address these soil productivity issues, the proponents have committed to using the BMPs described in Chapter 2.

Following the drilling, testing activities, and the construction of facilities, the disturbed areas not required for production of natural gas would be reclaimed to BLM standards. Facility areas and roads would be regraded to blend the disturbed area into the surrounding topography. Regraded areas and redistributed soil would be scarified to alleviate compaction, and seeded to prevent wind and water erosion. Measures to control erosion, runoff and sedimentation during operations and reclamation also are described in Chapter 2.

Biological soil crusts are very sensitive and easily damaged by off-road vehicle use. The use of vehicles off designated roads will be severely limited. This measure should ensure that minimal damage will occur to biological soil crusts potentially present in the JRPA.

Overall impacts to soil resources in the JRPA are anticipated to be minimal based on the following evaluation:

- Small area of disturbance;
- Use of proper construction and reclamation techniques; and
- Implementation of the measures described in Chapter 2.

4.4.2 No Action Alternative

Under the No Action alternative, none of the proposed activities will occur. No new disturbance of soils from oil and gas exploration will occur.

4.5 WATER RESOURCES

4.5.1 Alternative 1- Proposed Action

No significant effects on groundwater or surface water would be anticipated as a result of the project with the use of proper construction techniques, drilling practices, proper operating procedures, and employing the mitigation measures described in Chapter 2.

Groundwater would be removed from the coal seam aquifers within the Allen Ridge, Pine Ridge, and Almond Formations, members of the Upper Cretaceous Mesaverde Group. These producing formations range in depth from 1,952 feet to 5,900 feet. There is no current practical use for water in these coal formations due to drilling and management costs, the high level of TDS, and the availability of higher quality water from the shallower aquifers.

These targeted coal seams are classified as confined to semi-confined aquifers because they are bounded by confining layers that consist of impervious to semi-pervious layers of shale and siltstone. Hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams is limited. Confined, or artesian, aquifer conditions of this type indicate an effective seal above and below the aquifer. However, lowering the hydraulic head in the coal seam aquifers by removing water may induce a slight leakage through the semi-pervious shale layers into the pumped aquifer. Because of the extremely low hydraulic conductivity of the confining layers and the limited number of new gas wells proposed (16), enhanced leakage from an aquifer stratigraphically above or below the affected coal seams would be minimal.

Eight permitted water wells are located within one mile of the JRPA (WSEO 04). One of these wells is utilized as a domestic source of water, with the rest permitted for stock watering. The wells range in depth between 4 and 300 feet. Three of these wells are located within the inferred circle of influence (within a half-mile radius) of the proposed production wells. It is possible that this project could minimally lower water levels within these three wells located within the inferred circle of influence, although this potential is extremely unlikely. These wells are located much higher than the targeted coal seam aquifers. Thus, utilizing the deeper producing formations would not impact these shallower, economically important aquifers. Additionally, potential effects on water wells would be minimized by the mitigation measures described in Chapter 2.

The exploratory wells would produce water that would be disposed of in three deep injection wells. Depth of the injection wells, which would be completed in the Cherokee or Deep Creek sands, is expected to be between 3,800 and 4,600 feet. The produced water that would be injected in these wells is of higher quality than groundwater in these formations. The only effect on the injection horizons would consist of an increase in the hydraulic head emanating from the injection well, which would dissipate with distance away from the well bore. In terms of water quantity and quality, the effect of the Proposed Action on the injection horizon would be minimal.

The JRPA has one existing deep injection well that is utilizing Cherokee and Deep Creek Sandstone and has been permitted by the WOGCC. This groundwater has been tested to evaluate its suitability for disposal. The results showed this groundwater to be of lower quality

than the produced water targeted for disposal in the well. Maximum pressure requirements to prevent initiation and propagation of fractures through overlying strata to any zones of fresh water have also been determined and would be regulated by the State of Wyoming. The other two wells will also have permits prepared and submitted to the WOGCC. It is expected that water quality and fracture pressure limits will be similar to the existing well.

Because water produced would be injected, no surface waters of the state would be affected by the management of produced water. In addition, all of the wells are located in the Great Divide Basin and have no known connectivity to the Colorado or North Platte Rivers. This eliminates the potential for issues relating to depletion of these rivers. All water disposal plans would be permitted with the state agency that regulates the facilities, including but not limited to the WOGCC or WDEQ.

Produced water would be collected in a buried polyethylene flowline (pipeline) for transport to an injection well. To keep surface disturbance to a minimum, ditches would combine as many pipelines as possible (water, electricity, and gas). BMPs would be used to control erosion and divert overland flows away from the facility. Centrifugal pumps, reciprocating pumps, filter systems, and tanks at the disposal facility would be used to remove solids from the water stream and to pump the water at pressures sufficient to allow downhole disposal. If it is not possible to safely inject the volume of produced water into the proposed injection wells, some or all of the exploratory wells would be shut in temporarily while alternative plans are developed and approved. These alternative plans would include additional injection wells.

Information about the groundwater system in the JRPA would be obtained in two ways: first, by monitoring the quality of produced water; second, by monitoring the volume of water produced over time during testing. This information also would be used to quantify impacts during the interim drilling phase of this project for use in the preparation of the Atlantic Rim EIS and evaluating future field development.

All produced water is to be injected, with only small amounts of produced water provided to livestock or wildlife in self-contained tanks that would not discharge to surface drainages, the quality or quantity of surface water would not be affected directly by this use. The Proponents would implement BMPs to ensure that produced water is not spilled and that it would not come in contact with surface waters in the JRPA.

Potential effects on surface water resources would include increased surface water runoff and off-site sedimentation caused by soil disturbance, impairment to surface water quality, and changes in stream channel morphology caused by construction and road/pipeline crossings. Effects on surface water resources would depend on:

- The proximity of the disturbance to a drainage channel,
- The aspect and gradient of the slope,
- The degree and area of soil disturbance,

- Characteristics of the soil, duration of construction, and
- Timely implementation and success or failure of mitigation measures.

Increases in sedimentation that would occur as a result of the project would be minimal, because construction and operation would comply with measures described in Chapter 2. Potential impacts from construction would likely be greatest in the short-term and would decrease in time as a result of stabilization, reclamation, and revegetation. Construction disturbance would not be uniformly distributed across the JRPA, but instead would be concentrated near drill locations, access roads, and pipelines.

Water for use in drilling the wells would be obtained from existing wells completed in the coal seams of the Mesaverde Group. Approximately 700 barrels of water (almost 30,000 gallons) would be needed to drill each well. The actual volume of water used in drilling operations would depend on the depth of the well and any losses that might occur during drilling.

4.5.2 No Action Alternative

Under the No Action alternative, the proposed natural gas development would not occur. No new impacts to surface or ground water would occur as a result of natural gas exploration in the JRPA.

4.6 VEGETATION, WETLANDS, AND INVASIVE WEEDS

4.6.1 Proposed Action

Implementation of the project would result in the loss of natural vegetation in terms of cover and species composition in areas where well sites, facilities, and access roads would be constructed. An estimated 191.1 acres would temporarily be affected by surface disturbance associated with drilling and testing activities. Topsoil would be stockpiled, and reclaimed areas would be revegetated with site-specific seed mixes approved by the BLM to avoid permanent loss of species diversity and vegetative cover. Should the exploratory wells be productive, the surface areas required for production facilities would not be reclaimed until production ends, which could be up to 20 years. An estimated 57.7 acres could be affected by production facilities and roads over the long-term.

The Wyoming big sagebrush plant community type that would be disturbed during this project is commonly found across southwest Wyoming. The short-term or long-term loss of this plant community acreage in the JRPA would not alter the overall area or regional abundance and quality of these habitats. A total of 3,910 acres of this plant community is found in the JRPA. The long-term impacts of approximately 57.7 acres represent 1.5 percent of this plant community in the project area.

In general, the duration and effects on vegetation in the JRPA would depend on the time required for natural succession to return disturbed areas to pre-disturbance conditions of diversity (both species and structural). In addition, the success of mitigation (seeding) would be influenced by climatic and soil conditions.

Surface disturbance could affect vegetation directly and indirectly by removal of existing vegetation and by introducing invasive weeds. Weedy species often thrive on disturbed sites such as road ROWs, and out-compete more desirable plant species. No existing patches of invasive weeds were identified in the JRPA. The potential for weeds to occur will increase with construction activities occurring in the JRPA. Utilizing proper BLM approved reseeding mixtures will help mitigate the potential for noxious weed invasion on disturbed sites. Additionally, monitoring of disturbed sites would be required to identify any weed invasion.

No threatened or endangered plant species are expected to occur in the JRPA because of a lack of suitable habitat. Therefore, development of the project is not expected to directly affect federally listed plant species.

The occurrence of sensitive plant species is likely limited on the JRPA due to a lack of suitable habitat for most of the species. None of the sensitive plant species discussed in Chapter 3 has known occurrences within the JRPA (WYNDD 2003). Given the low likelihood that sensitive plant species occur on the JRPA and the small amount of disturbance associated with the Proposed Action, no impacts to sensitive plant species are expected.

Minor impacts to wetlands or riparian areas are anticipated, given that most of the disturbance will occur outside the Fillmore Creek and Separation Creek watersheds. However, a proposed access road would cross Fillmore Creek and potentially disturb riparian/wetland habitat. Impacts to this habitat would be less than a third of an acre. These impacts would be mitigated through use of BMPs and proper low water road crossing construction. Additionally, the pipeline ROW will cross Separation Creek at two locations. These stream crossings will be trenched and result in some temporary disturbance to riparian vegetation. Impacts resulting from these stream crossings would be less than a third of an acre. However, the stream banks will be repaired and revegetated upon installation of the pipeline.

4.6.2 No Action Alternative

Under the No Action Alternative, no new natural gas impacts to vegetation or wetlands will occur. Additionally, no new disturbances will occur that could allow noxious weeds infestation to occur in the JRPA.

4.7 RANGE RESOURCES AND OTHER LAND USES

4.7.1 Proposed Action

Anticipated effects on range resources associated with the project are limited to a minimal long-term loss of 57.7 acres of forage and associated AUMs, an increased potential for collisions between livestock and vehicles, and an increased potential for the spread of noxious and invasive weed species (previously discussed above under the section on Vegetation, Wetlands, and Noxious Weeds).

Livestock grazing would continue during drilling and interim development. Forage in the JRPA would be reduced slightly during drilling and field development and would be restored as soon as practical. Areas used for roads, production equipment, and ancillary facilities would remain disturbed throughout the productive life of the field. The increased traffic during the drilling and

field development phases would correspondingly increase the potential for collisions between livestock and vehicles.

The average stocking rate for the Fillmore Allotment is 5.75 acres per AUM. The project would result in a short-term (145.05 acres of short-term disturbance) loss of forage associated with almost- 25 AUMs in the allotment. The long–term (57.7 acres of long-term disturbance) forage loss will eliminate approximately 10 AUMs.

Reclamation may increase forage production and availability in the short-term, since sagebrush would be removed and reseeded with native grass species. This would be beneficial to grazing species such as big game and cattle.

4.7.2 No Action Alternative

Under the No Action alternative, none of the proposed natural gas activities would occur in the JRPA. Loss of rangeland and AUM's due to this development would not occur. However, beneficial results of this activity (increases in grasses) for rangeland dependent livestock and big game would also not occur.

4.8 WILDLIFE AND FISHERIES

4.8.1 Proposed Action

The proposed development would disturb approximately 191.1 acres of general wildlife habitat during the development phase. Approximately 57.7 acres of long-term disturbance would remain following reclamation for the life of the project. Analysis of potential impacts of the proposed development upon wildlife assumes development of the wells, roads, and other facilities in the approximate locations identified in Figure 2-1.

During the production phase, the unused portion of well sites and pipelines would be reclaimed. Following completion of production operations (life of the project is estimated at 10-20 years), the well field and ancillary facilities would be reclaimed and abandoned. Well pads would be removed and the areas revegetated with seed mixes approved by the BLM, some of which would be specifically designed to enhance wildlife use. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts. Additionally, another extremely important factor is the time needed for natural succession to return revegetated areas to predisturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation; however, much more time would be required to achieve reestablishment of shrub communities. Consequently, disturbance of shrub communities would result in a long-term loss of those habitats.

In addition to the direct loss of habitat due to construction of well pads, roads, and pipelines, disturbances from human activity and traffic would lower wildlife utilization of habitat immediately adjacent to these areas. Species that are sensitive to indirect human disturbance (noise and visual disturbance) would be impacted most. Habitat effectiveness of these areas would be lowest during the construction phase when human activities are more extensive and localized. Disturbance would be reduced during the production phase of operations and some animals may become accustomed to equipment and facilities in the gas field and may once again

use habitats adjacent to disturbance areas, while other animals may move to other areas outside the disturbance area.

General Wildlife

The direct project disturbance of wildlife habitat in the JRPA and outside the project boundaries would reduce habitat availability and effectiveness for a variety of common small mammals, birds and their predators. The initial phases of surface disturbance would result in some direct mortality to small mammals and the displacement of songbirds from construction sites. In addition, a slight increase in mortality from increased vehicle use of roads in the project area is expected. Quantification of these losses is not possible; however, the impact is likely to be low over the short-term. Due to the relatively high production potential of these species and the relatively small amount of habitat disturbed, small mammal and songbird populations would rebound to a level slightly below pre-disturbance levels following reclamation of pipelines, unused portions of roads, well pads, and wells that are no longer productive. No long-term impacts to populations of small mammals and songbirds are expected.

Big Game

Impacts to big game wildlife species would include direct loss of habitat and forage, and increased disturbance from drilling, construction, and maintenance operations. Construction activities associated with well pads and roads can reduce use of surrounding habitat by big game. Although these impacted sites reduce foraging due to the direct loss of native vegetation from ground disturbance, there is an area surrounding these sites that tends not to be utilized due to increased human activity. This "zone" can extend up to a half mile from the developed area. Consequently, development impacts to wildlife can extend further offsite than the actual amount of ground disturbance.

Disturbance of elk during the parturition period and on winter range can increase stress and may influence species distribution (Hayden-Wing 1980, Morgantini and Hudson 1980). There may also be a potential for an increase in poaching and harassment of big game, particularly during winter. According to management directives in the RMP (USDI-BLM 1990), crucial big game winter ranges will be closed from November 15 - April 30; this closure of areas located in crucial big game winter ranges will reduce disturbance to wintering big game. This closure would also limit the potential for poaching and/or harassment of big game species wintering in the area.

The JRPA supports antelope throughout the year. Approximately 99.9 acres of pronghorn winter/yearlong range and 22 acres of spring/summer/fall range would be disturbed under the Proposed Action within the project boundary. Approximately 11.9 miles of the pipeline would be located within spring/summer/fall range, disturbing approximately 71.8 acres. The remainder of the pipeline would be located in winter/yearlong range, disturbing approximately 3 acres. Following reclamation, approximately 46.9 acres of winter/yearlong range **(0.02 % of the winter/yearlong range in the Baggs Herd Unit)** and 10.8 acres of spring/summer/fall range **(0.003% of spring/summer/fall range in the Baggs Herd Unit)** would remain disturbed for the life of the project. No pronghorn crucial winter range would be disturbed under the Proposed Action. Activities associated with the construction phase of the project would likely temporarily displace antelope, however, once construction is complete antelope would likely habituate and return to pre-disturbance activity patterns, while other animals may move to other areas outside

the disturbance area. Reeve (1984) found that pronghorn acclimated to increased traffic volumes and machinery as long as the traffic and machines moved in a predictable manner. In combination, the disturbance of pronghorn seasonal ranges and the potential for pronghorn displacement would reduce the quality of pronghorn habitat surrounding project facilities on the JRPA. The displacement of pronghorn and disturbance of habitats is considered a short-term impact because of the temporary nature of the displacement and the availability of comparable habitats in adjacent areas.

The JRPA supports mule deer year round. All of the JRPA is classified as mule deer winter/yearlong range. All of the proposed wells and developments within the JRPA would occur in mule deer winter/yearlong range for a total of 121.9 acres of disturbance under the Proposed Action. Approximately 1.75 miles of the pipeline would be located within mule deer spring/summer/fall range, disturbing approximately 10.6 acres. The remainder of the pipeline would be located within mule deer winter/yearlong range, disturbing approximately 64.2 acres. Following reclamation, approximately 57.7 acres of mule deer winter/yearlong range **(0.005% of the winter/yearlong habitat in the Baggs Herd Unit)** would remain disturbed within the JRPA for the life of the project. Activities associated with the construction phase of the project would likely temporarily displace mule deer, however, once construction is complete some of the mule deer would likely habituate and return to pre-disturbance activity patterns, while other animals may move to areas outside the disturbance area. In combination, the disturbance of mule deer seasonal ranges and the potential for mule deer displacement would reduce the quality of mule deer habitat surrounding project facilities on the JRPA. However, the potential displacement of mule deer and disturbance of habitats is considered a short-term impact because of the temporary nature of the displacement and the availability of comparable habitats in adjacent areas.

The JRPA supports elk during the winter months and the entire JRPA is classified as elk winter range or crucial winter range. None of the proposed development within the JRPA would occur within the small amount of crucial winter range found in the JRPA. All of the proposed wells and developments within the JRPA would occur in elk winter range for a total of 70.2 acres of disturbance under the Proposed Action. Approximately 0.27 miles of the pipeline would be located just within elk crucial winter range, disturbing approximately 1.6 acres. The remainder of the pipeline would be located within elk winter range, disturbing approximately 73.2 acres. Following reclamation, approximately 57.7 acres of elk winter range **(0.02 % of the winter range in the Sierra Madre Herd Unit)** would remain disturbed within the JRPA for the life of the project. In combination, the disturbance of elk seasonal ranges and the potential for elk displacement would reduce the quality of elk habitat surrounding project facilities on the JRPA. However, no significant adverse impacts upon the elk utilizing the project area are expected provided that mitigation measures contained in this document and the RMP are implemented.

Greater Sage-grouse

Suitable greater sage-grouse habitat is abundant on and around the JRPA and specific measures must be taken to avoid impacting this species. Greater sage-grouse are of special concern because populations throughout the west have been declining; they are listed as a BLM sensitive species, and have been petitioned for listing under the ESA. Under the Proposed Action, 191.1 acres of the Wyoming big sagebrush primary vegetation cover type would be disturbed during construction and 57.7 acres in the long-term. This amount of habitat disturbance is minimal (1.5

% long-term) considering the amount available in the project area. Greater sage-grouse may also avoid areas associated with development including roads, well pads, and pipelines. Greater sage-grouse may also be impacted by noise disturbance associated with human activity, traffic, compressor stations, and drilling operations. Resource specific mitigation measures for greater sage-grouse in this document would minimize the impacts to leks, nesting areas, and severe winter relief habitats are avoided or minimized. Ten active greater sage-grouse leks have been identified within two miles of the JRPA and the sales pipeline.

Construction activities within a two-mile radius of occupied leks would be restricted between March 1 and June 30 to provide protection for grouse during the egg-laying, incubation, and brood-rearing period. Exceptions may be granted by the BLM if they determine the activity has no impact on the species. Only one of the proposed wells on BLM surface (AR FED 1890 NW-4) was not located within potential greater sage-grouse nesting habitat. Approximately 1,509.7 acres of suitable nesting habitat were mapped on the BLM surface land within the JRPA. Nine of the proposed wells and 5.5 miles of road and gathering lines would be located within potential greater sage-grouse nesting habitat on BLM surface land. Together, the proposed wells, road and gathering lines would disturb approximately 65.9 acres of potential nesting habitat on BLM surface land within the JRPA. It is likely that the remaining proposed wells and access roads not located on BLM surface would be located within potential greater sage-grouse nesting habitat. If all avoidance and mitigation measures identified in this document, the RMP, and the Interim Drilling Policy are implemented, impacts to greater sage-grouse are expected to be minimal.

Raptors

The potential impacts of the Proposed Action on raptors are: (1) nest abandonment and/or reproductive failure caused by project related disturbance, (2) increased public access and subsequent human disturbance resulting from new road construction, and (3) small, temporary reductions in prey populations.

The primary potential impact to raptors from project activities is human disturbance during the nesting season (Feb 1 – July 31) that might result in reproductive failure. To minimize this potential, disturbance would not be allowed during the critical nesting season near active raptor nests. Seasonal timing restrictions within a "buffer zone" around nests to avoid disturbance to nesting raptors should reduce impact from construction activities. The BLM may attempt to relocate well pad facilities if they fall within 1200 feet of a ferruginous hawk nest and 825 feet of any other hawk species nest. Exceptions may be granted by the BLM if they determine the activity has no impact on the species. No active raptor nests were located on or within one mile of the JRPA during 2004 (HWA 2004). However, one inactive ferruginous hawk nest was found on the JRPA during a BLM onsite review in 2004. Two active raptor nests (one red-tailed hawk and one golden eagle) were located within one mile of the pipeline in 2004. Raptors may nest in currently unoccupied areas in the future and if active nests are located on the project area in future years, appropriate avoidance and mitigation measures would be taken to avoid significant impacts to breeding raptors.

Fish

No impacts to fish resources are expected since all of the proposed JRPA facilities are located within the Great Divide Basin.

4.8.1.1 Threatened, Endangered, and Proposed Wildlife, and Fish Species

Wildlife Species

In Wyoming, white-tailed prairie dog colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food, and they depend upon prairie dog burrows for shelter, parturition, and raising young (Hillman and Clark 1980). The FWS, in coordination with the WYGFD have determined which prairie dog complexes have the potential to support wild populations of black-footed ferrets in the State of Wyoming. The JRPA is not located in one of those prairie dog complexes; therefore, surveys for black-footed ferrets were not required within the JRPA. The RFO does attempt to move all surface disturbing activities outside of prairie dog towns, since prairie dogs are on the Wyoming BLM State Sensitive Species List. The small white-tailed prairie dog town located in Section 6 is not expected to be disturbed given the current proposed location of wells and access roads.

Canada lynx are not expected to occur on the JRPA because of the lack of suitable habitat; however, there is the slight potential that lynx may migrate through the area. The proposed project is not expected to prevent potential lynx migration through the area.

Bald eagles typically build stick nests in the tops of large coniferous or deciduous trees along streams, rivers or lakes. This type of habitat is not present on the JRPA, and bald eagles are not known or expected to nest on the JRPA. Bald eagles may utilize the JRPA during winter months when big game species are more concentrated on winter ranges. However, the JRPA does not support concentrated use by bald eagles and bald eagle use of the JRPA is likely incidental. Bald eagles may feed on road-killed carrion in the general vicinity of the JRPA and workers should be educated about the danger of striking a bald eagle with a vehicle along the main highways and roads providing access to the JRPA. The Proposed Action is not expected to impact bald eagles provided that the avoidance and mitigation measures in this document, the RMP, and the Interim Drilling Policy are implemented.

4.8.1.2 Sensitive Wildlife and Fish Species

Wildlife Species

Of the sensitive species listed by the BLM for the RFO area, the species with the highest potential to occur on the JRPA are the white-tailed prairie dog, sage sparrow, Brewer's sparrow, sage thrasher, western burrowing owl, loggerhead shrike, greater sage-grouse (see discussion above), mountain plover, ferruginous hawk, and northern goshawk (see raptor section). The likelihood of the remaining sensitive species occurring on the JRPA is low; therefore, no impacts would occur to these species from the Proposed Action.

Burrowing owls are typically associated with prairie dog burrows. Burrowing owls may utilize the prairie dog town on the JRPA, however no disturbance is proposed to occur in the prairie dog

town; therefore, the proposed development is not expected to impact burrowing owls or white-tailed prairie dogs. The sage sparrow, Brewer's sparrow, sage thrasher, and loggerhead shrike are all associated with shrub-dominated habitats (primarily sagebrush and greasewood in the JRPA). Minimizing disturbance of these habitats would decrease any potential impacts to these species. However, human activity may temporarily displace these species from areas near the project facilities. Implementation of the Proposed Action is expected to have minor impacts upon these species due to the limited amount of habitat disturbance.

Although ideal mountain plover habitat does not occur in the project area, some areas of potential mountain plover habitat do occur. No mountain plovers were observed in the potential habitat areas during surveys conducted in 2001, 2002, and 2003. A portion of the potential mountain plover habitat along the pipeline and near Well #1890-NW-9, Well #1890 NE-18, and Well # 1990 SE-32 would be disturbed with implementation of the Proposed Action. Impacts to mountain plovers would be minimized by avoiding construction activities in potential plover nesting habitat during the nesting period from April 10 -July 10. The exact location of mountain plover nests may change annually, and mountain plover nest activity status and location must be kept current. For this reason, surveys for mountain plovers will be required if an exception to the mountain plover stipulation is requested within areas of potential habitat during the nesting season. These surveys would occur prior to any surface disturbance in those areas, and be in accordance with the current mountain plover survey protocol (USDI-FWS 2002). No impacts to mountain plovers are expected provided that avoidance and mitigation measures outlined in this document and the RMP are implemented.

In summary, no significant impacts upon sensitive wildlife species are expected provided that avoidance and mitigation measures in this document, the RMP, and the Interim Drilling Policy are followed.

Fish Species

No sensitive fish species occur within the JRPA.

4.8.2 No Action

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on wildlife and fish resources would be expected to occur if the proposed wells are not drilled.

4.9 RECREATION

4.9.1 Proposed Action

The interruption of hunting activities in the JRPA represents the only recreation impact in the JRPA. Project activities would result in a temporary displacement of some hunters, particularly during construction and drilling. Some hunters perceive these activities as displacing game species and creating an environment that detracts from the hunting experience. Displacement would be highest during the grouse, pronghorn, deer, and elk season, when the most hunters utilize the area. The proposed drilling schedule would limit displacement to one season. It is not known if outfitters utilizing the JRPA will move their operations to another location.

Some long-term displacement of hunters likely would occur as a result of the project. Human access and activity would increase under the project, especially with the improved and new access roads. Overall, effects on the recreation resource would be minimal because of the short-term nature of drilling and construction and concentrated locations of these activities.

4.9.2 No Action Alternative

Under the No Action alternative, no disturbance to hunting and other recreation would occur in the JRPA as a result of natural gas activity.

4.10 VISUAL RESOURCES

4.10.1 Proposed Action

The severity of visual impact within the BLM Visual Resource Management (VRM) rating system is related to the scenic quality, sensitivity level, and distance zone of the affected environment. The JRPA short-term and long-term visual impacts would be considered acceptable in this Class III area. The contrasts during construction would be seen by relatively few viewers and would be visible only for a short time.

Minor short-term impacts to visual resources associated with construction and drilling would include contrasts in line, color, and texture. These contrasts are associated with drilling rigs, construction equipment, facilities, roads, trailers, and the general industrial character of drilling. Additional impacts may occur from fugitive dust produced by construction and increased vehicle traffic.

Permanent wells and production facilities would remain after well drilling is completed. The presence of permanent facilities would create continued visual impacts over the long term. Mitigation measures described in Chapter 2 would decrease and minimize these visual impacts.

4.10.2 No Action Alternative

Under the No Action alternative, no new natural gas development impacts to visual resources would occur in the JRPA.

4.11 CULTURAL RESOURCES

4.11.1 Proposed Action

A Class III cultural resource survey has been conducted for all federal lands proposed to be disturbed, including well pads, new access roads, road upgrades, compressor and facilities sites, and pipelines.

Impacts to cultural resource sites in the JRPA will be mitigated by avoidance or data recovery. In certain circumstances, a combination of the two could be utilized to prevent impacts. Avoidance will usually consist of moving or realigning the site to avoid disturbing significant sites. Utilizing this mitigation measure is the preferred method to avoid impacts to cultural resource sites. If avoidance can not be accomplished, data collection will be utilized to recover and record the site artifacts and history.

A total of five cultural resource sites were identified in the Class III survey. None of these sites were eligible for the NRHP. Additionally, a viewshed analysis of the well pads and roads determined no affect to the Rawlins-Baggs Stage Road.

Surveys conducted for the project included 10 acres for each well pad and a 150 foot ROW for roads and pipelines (combined ROW). Potential damage to these sites would most likely occur from surface disturbance during construction. These surveys ensure that sites will be identified and no damage will occur from planned surface disturbing activities. Specific mitigation measures required by the BLM for cultural resources are identified in Chapter 2. Other mitigation measures initiated to protect cultural resources would be ensuring natural colors are utilized for facilities and roads. Additionally, utilizing road configurations that conform to the landscape would prevent impacts to cultural resources.

The Rawlins-Baggs Stage Road is located near the JRPA and is eligible for the NRHP. If it is determined the sales pipeline impacts this road, Section 106 consultation would be initiated between the BLM and the Wyoming State Historic Preservation Office. Mitigation measures such as decreasing the ROW width for the pipeline would be utilized to prevent impacts to this site.

Native American religious sites have not been previously identified in the area. The Class III survey did not identify any of these sites on the JRPA.

4.11.2 No Action Alternative

Under the No Action Alternative, no cultural resource sites would be potentially disturbed by new natural gas development in the JRPA.

4.12 SOCIOECONOMICS

4.12.1 Proposed Action

Socioeconomic impacts of the project would be largely positive. The project would enhance regional economic conditions and generate revenues from local, state, and federal government taxes and royalties. Most of the workforce would originate from personal located in southwestern Wyoming. The relatively small, short-term field development workforce would not create a local boom or increased demand for temporary housing or local government services.

Development and operation of the project would require goods and services from a variety of local and regional contractors and vendors. Expenditures by the Proponents for these goods and services, coupled with employee and contractor spending, would generate economic effects in Carbon County and southwest Wyoming. It is reasonable to assume that the direct and indirect economic benefits of the project would be positive.

4.12.1.1 Oil and Gas Activity in Carbon County

To date in 2004, 151 APDs have been issued for natural gas wells in Carbon County. The 16 new wells associated with the project would be approximately 11 percent of the current 2004 APD level for the county. This project will not result in a significant increase in natural gas

wells in Carbon County. However, if successful, this project may increase the likelihood that the ARPA will be developed.

4.12.1.2 Population Effects

This project will not result in a noticeable population increase in Carbon County. Most of the skills and services required for the project are available in the local labor pool, although the recent increase in oil and gas drilling in southwest Wyoming has absorbed much of the available work-force. The project would require 16 to 36 drilling and field development workers for a period of 2-3 months. Many of these workers will be from southwestern Wyoming.

Based on the relatively small workforce, and short-term nature of the drilling and field development phase of the project, area housing and businesses could accommodate the increase in activity resulting from the development of the project.

4.12.1.3 Temporary Demand for Housing

Existing housing in Rawlins and nearby communities could accommodate the relatively small demand for temporary housing during drilling and field development.

4.12.1.4 Law Enforcement and Emergency Response

The relatively small level of field development and operations personal would be accommodated by existing law enforcement and emergency management resources.

4.12.1.5 Fiscal Effects

The federal government receives a 12.5 percent royalty on the fair market value of natural gas produced from federal leases. Half of these royalties would be returned to the State of Wyoming. The State of Wyoming collects a six percent severance tax on gas production, exempting federal royalties, production, and transportation costs. The state also collects a four percent sales tax on goods. Twenty eight percent of these funds are returned to the local county. These natural gas revenues represent a substantial funding source for the State of Wyoming and Carbon County.

If the productive life of each successful gas well in the project is 15 years and produces on average nearly 100 MCF per year of natural gas, which is sold (on average) for $2.50 per MCF, the sales value of each well would be about 3.5 million over the life of the project. If 10 federal gas wells within the project were productive, the federal royalties would be approximately $6 million. The severance tax collected by the State of Wyoming would be approximately $2 million. These numbers are approximate, and are only intended to indicate the order of magnitude of possible fiscal effects.

4.12.2 No Action Alternative

Under the No Action alternative, no federal mineral royalties would be gathered and no additional socioeconomic effects would be expected to occur if the JRPA wells are not drilled.

4.13 TRANSPORTATION

4.13.1 Proposed Action

4.13.1.1 Federal and Sate Highways

The project would not significantly increase the volume of traffic on federal and state highways that provide access to the JRPA. Some minor increases would result from movement of project-related workers, equipment, and materials to and from the JRPA for drilling, field development, well service, field operations, and reclamation.

The only major federal highway near the project area is I-80, and this project should not result in any noticeable traffic increase on this highway.

Based on these relatively small traffic increases and short duration in traffic volume, the project would not result in a measurable increase in accident rates on federal and state highways. During the operations phase, the probability of an increase in accident rates that could be attributed to the project would be negligible.

4.13.1.2 County Roads

The project would increase traffic on the county roads that provide access to the JRPA. The relatively small, short-term increases in traffic are unlikely to result in significant deterioration of the roads or substantial increases in accidents. The primary effects of increased project traffic on county and BLM roads would be accelerated requirements for maintenance.

Increased traffic may raise the potential for accidents between vehicles and livestock. The potential for these accidents increases during calving and periods when cattle are moving to new ranges. To reduce the likelihood of this occurring, the Proponents should coordinate their development efforts with ranchers to prevent these accidents.

4.13.1.3 Internal Roads

The proponents would be responsible for constructing and maintaining new and improved roads within the JRPA. No fiscal impacts resulting from the development or maintenance of roads are anticipated for the BLM or Carbon County.

4.13.2 No Action Alternative

Under the No Action alternative, no additional roads would be constructed to access natural gas facilities. Additionally, traffic levels would remain at existing levels in the JRPA.

4.14 HEALTH AND SAFETY

4.14.1 Proposed Action

The Proposed Action would create a slightly higher level of risk to workers and visitors in the JRPA. An increase in traffic would raise the potential for accidents between gas workers, ranchers, and visitors (hunters etc.). Some other minimal risks are associated with oil and gas construction and operations, and firearm accidents, although this risk is extremely low.

4.14.1.1 Occupational Hazards

The statistical probability of injuries is low during the drilling and field development phase of the project, when a peak number of 36 workers may be employed.

The BLM, OSHA, United States Department of Transportation (USDOT), WOGCC, and WDEQ each regulate certain safety aspects of oil and gas development. Adherence to relevant safety regulations by the Proponents and enforcement by the agencies would reduce the probability of accidents. Additionally, in light of the remote nature of the JRPA and the relatively low use of these lands by others (primarily grazing permittees and hunters), occupational hazards associated with the project would mainly be limited to employees and contractors rather than the public.

4.14.1.2 Other Risks and Hazards

Risks to public health and safety are not expected to increase under the project. Impacts associated with sanitation or the materials used in CBNG development would be prevented or reduced by the mitigation measures described in Chapter 2.

The potential for firearms-related accidents would occur during hunting season. However, the substantial activity in the JRPA would encourage hunters to seek more isolated hunting units, reducing the potential for accidents.

The risk of fire in the JRPA could increase with the project, but would remain low. Fire is a potential impact associated with construction, industrial development, and the presence of fuels, storage tanks, natural gas pipelines, and gas production equipment. This small risk would be reduced further because facilities would be situated on pads and in locations that are graded and devoid of vegetation. In the event of a fire, property damage most likely would be limited to construction- or production-related equipment and rangeland resources. Fire suppression equipment, a no smoking policy, shutdown devices, and other safety measures typically incorporated into gas production also would minimize the risk of fire.

4.14.2 No Action Alternative

Under the No Action alternative, no new natural gas development would occur in the JRPA, resulting in no increase in safety issues in the area.

4.15 HAZARDOUS MATERIALS

4.15.1 Proposed Action

All project-related activities involving hazardous materials will be conducted in a manner that minimizes potential environmental impacts. Potential impacts associated with hazardous materials include human contact, inhalation or ingestion, and the effects of exposure, spills or accidental fires on soils, surface and groundwater resources and wildlife. No hazardous substance, as defined by CERLA, will be used in the construction or drilling operations associated with these wells. No RCRA hazardous wastes will be generated by well-drilling operations.

The risk of human contact would be limited predominantly to the operator and contractor/subcontractor employees. Mitigation measures described in Chapter 2 would reduce the risk of human contact, spills and accidental fires, and provide protocols and employee training to deal with these events should they occur. Based on successful implementation of these plans and procedures, no significant impacts associated with hazardous materials would be anticipated. Any spills of oil, gas, or any potential hazardous substance will be reported immediately to the BLM, landowner, local authorities, and other responsible parties and will be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

4.15.2 No Action Alternative

Under the No Action alternative, no new natural gas wells would be drilled and no issues related to hazardous material would be encountered in the JRPA.

4.16 NOISE

4.16.1 Proposed Action

Noise associated with construction and natural gas production operations can cause disturbance that affects human safety (at extreme levels) or comfort and can modify animal behavior. Noise levels that exceed the 55-dBA maximum standards can occur at construction and production operations. Noise levels around a compressor engine contained in an enclosed building would be below 55-DBA at an estimated 600 feet from the compressor site (BLM 1999b). Construction-related impacts would be short-term (less than 2 years), lasting as long as construction was under way at well sites, access roads, pipelines, and other ancillary facilities such as compressor sites. Noise would be created over a longer term at the individual well sites as a result of production facilities.

With no human population living in or near the JRPA, little noise impact is expected from the project. However, some noise disturbance to livestock and wildlife may result from the project.

4.16.2 No Action Alternative

Under the No Action alternative, no noise impacts from new natural gas development would occur in the JRPA.

4.17 CUMULATIVE IMPACTS

Cumulative impacts consist of an impact that is created as a result of the combination of the project evaluated in this document together with other projects causing related impacts. These impacts occur when the incremental impact of the project, when combined with the effects of other past, present, and reasonably foreseeable future projects are cumulatively considered. This typically occurs when impacts compound or increase existing environmental problems in an Area of Influence (AOI). Depending on the resource, the AOI may be the project area or it could have a larger area of influence (Such as the ARPA).

Increasing natural gas development in the ARPA would create additional environmental impacts that could stress critical resources in the region. Energy development represents the only large scale activity in the ARPA that could be associated with increasing adverse resource impacts.

This discussion of cumulative impacts will focus on existing and future energy development in the ARPA.

The ARPA is approximately 40 miles long and consists of nine CBNG pods. Each pod can contain a maximum of 24 wells. The JRPA is being authorized under the Interim Drilling Policy which allows up to 200 wells to be drilled prior to completion of the Atlantic Rim EIS. Existing CBNG development currently authorized under this policy is located in the Sun Dog, Cow Creek, Blue Sky, Doty Mountain, and Red Rim sites. This represents a total of 120 CBNG wells currently authorized under the Interim Drilling Policy.

4.17.1 Geology, Minerals, and Paleontology

The AOI for geology, minerals, and paleontology would be the JRPA.

Existing, proposed, and reasonably foreseeable actions would not add or create additional geologic hazards such as landslides, mudslides, debris flows, or slumps.

Existing and proposed development of mineral resources consists of CBNG development in the JRPA. Cumulative impacts to geologic resources would be minimal and consist of some alteration to the surface topography. Standard project and site specific construction procedures would be required for all proposed development on federal lands.

Proposed development could potentially impact paleontological resources. Adherence to BLM requirements for the protection of this resource should mitigate any adverse impacts to fossils present in the project area. Potential location of these resources during construction would be a positive impact and may result in a scientifically significant discovery.

4.17.2 Air Quality

The AOI for air quality would encompass the ARPA and could extend to Class I or II wilderness areas located within 100 miles of the project. Cumulative impacts from emissions could affect an area well beyond the borders of the ARPA.

Existing and planned natural gas development in the ARPA would impact air quality through increased emissions associated with vehicles, machinery, and compressors. In addition, fugitive dust emissions would increase and would vary depending on traffic volumes. Cumulative impacts from the project would be similar to those analyzed in the Continental Divide/Wamsutter II EIS and the Desolation Flats EIS. As discussed in the air quality section, the modeling completed for the Desolation Flats EIS determined that air emissions would be below federal and state standards. Air emission impacts from the JRPA would be minimal in the immediate project vicinity, minimal effects in the near field, and would incrementally contribute to a reduced far field visibility effect.

Overall, this project would contribute minor emissions in the ARPA. However, when combined with the other ongoing or planned development in the ARPA, the emission levels would contribute to incremental regional emission increases.

4.17.3 Soils

The AOI for soils includes the JRPA, and includes all disturbances related to the construction and operation of wells, facilities, pipelines, and roads.

Cumulative impacts include effects on soil from planned exploration and development, completed facilities, and reasonably foreseeable activities. Minimal impacts to soils can be expected from these actions if all of the site specific mitigation and reclamation procedures are followed. Most of the disturbance to soils would be short-term and would not contribute to loss or degradation of this resource in the future. If properly reclaimed, soil stability and productivity should improve over the life of this project.

4.17.4 Water Resources

The AOI for groundwater resources would be the Great Divide Basin. CBNG development in the ARPA could impact groundwater resources in the basin through withdrawal of groundwater and infiltration of this water if surface discharge is utilized. The water in the producing formations is high in salt content and is located at depths that make it economically unfeasible to utilize for commercial purposes. However, this project is going to dispose of produced water through three injection wells planned for the project. This water would be injected into these wells for the life of the project. No cumulative impacts to Mesaverde Group groundwater resources would occur during this project.

Since the project is located in the Great Divide Basin, all groundwater flow is contained in the basin. With no connection to the Colorado River or North Platte River, ground water connectivity to this surface water is not an issue for this project or others planned in the basin.

Overall, no cumulative impacts to groundwater resources are expected from this project.

The AOI for surface water resources would be limited to Fillmore and Separation Creek watersheds and associated stock reservoirs. Cumulative impacts to surface water would occur primarily during construction and would decrease as reclamation efforts stabilize soils. The surface disturbance from natural gas development in these watersheds could contribute to increased sediment loading. Increased sediment entering the stock ponds would continue to lower their water holding capacity. This may require monitoring and increased use of BMPs to lower sediment loads entering these reservoirs. Overall protection of these surface waters would be maintained through use of BMPs stipulated by the BLM. CBNG development would be limited to the 24 wells in the JRPA and would not include additional development beyond that number.

No cumulative effects to surface water resources are expected from this Proposed Action.

4.17.5 Vegetation, Wetlands, and Invasive Weeds

The AOI for vegetation (including wetlands and weeds) consists of the JRPA. Cumulative impacts for vegetation in the JRPA would consist of past and proposed CBNG development, reasonably foreseeable activities, and vegetation management connected with range improvements.

Potential cumulative impacts resulting from these activities would primarily consist of loss of vegetative cover and potential weed infestation. Overall, the loss of vegetation is minimal and would be mitigated by reclamation. The total long-term loss of vegetative cover from this CBNG development is approximately 57.7 acres. This loss would not contribute to a significant decrease in vegetative cover in the JRPA.

The potential for weed infestation does exist from the proposed development. However, following the BLM stipulations for weed infestation would minimize this threat.

No sensitive (threatened, endangered, candidate, proposed, or sensitive) plant habitat is known to occur in the project area.

Overall, only minimal cumulative impacts to vegetation are expected from this project.

4.17.6 Range Resources and Other Land Uses

The AOI for range resources is the 42,335 acre Fillmore Allotment.

Cumulative impacts resulting from proposed CBNG development would consist of the loss of approximately 57.7 acres of the allotment. This minimal reduction would not significantly impact the allotment. Additionally, the reseeding of disturbed sites would convert sagebrush habitat to native grass habitat. This would be a short-term beneficial range resource impact resulting from the Proposed Action.

4.17.7 Wildlife and Fisheries

The AOI for wildlife resources is determined by range of wildlife and BLM stipulations protecting species from project related impacts. Big game species have an AOI based on the WGFD herd units. Greater sage-grouse have an AOI of a two-mile buffer around the project area. Raptors would have an AOI that includes a one-mile buffer around the project. Other smaller wildlife species would have an AOI of only the project area.

The short-term cumulative impacts to wildlife would include disruption of wildlife during development and operation of CBNG operations. This disruption would include displacement of wildlife, loss of some habitat, and greater access to the JRPA. For instance, the construction phase of the project would involve greater disturbance and more human activity.

The cumulative impacts from the current and proposed development in the JRPA, has the potential to impact big game (antelope, deer, elk) in the long-term. The combination of habitat being converted to CBNG facilities and the human disturbance factor (noise and vehicles) has the potential to displace big game species. The development occurring under the interim development plan can not occur where two big game crucial winter ranges overlap. The JRPA contains only 1.8 acres of crucial elk winter range in the extreme southeast corner of Section 9. Deer and antelope utilize the JRPA for winter/yearlong range. Cumulative impacts to big game resulting from this project are minimal and no long-term damage to crucial winter range would occur. However, long-term displacement of big game may occur as additional natural gas development (other than JRPA) occurs in the ARPA.

Impacts to greater sage-grouse should be mitigated through BLM seasonal stipulations. A total of ten active leks, three inactive leks, and six leks of unkown status are located on and within two miles of the JRPA and sales pipeline. The impacts associated with this project, plus other impacts such as increased noise, vehicle traffic, range improvement projects, and prolonged drought can result in additional cumulative impacts to greater sage-grouse in the JRPA and adjacent lands. These impacts when measured together could disrupt lek activity and displace nesting birds.

Surveys identified two active raptor nests within one mile of the sales pipeline and one inactive nest within the JRPA. Cumulative impacts to raptors should be mitigated by BLM seasonal restrictions which prevent activity within one mile of raptor nests. Additional noise and human disturbance associated with this project, and increased use of the area in the future, could displace nesting raptors.

Several BLM sensitive species may occur within the JRPA. Cumulative impacts to these species should be minimized by the small scale of the project, as only 57.7 acres of permanent disturbance would occur as a result of the project.

4.17.8 Recreation

The AOI for recreational resources would include the JRPA and a one mile buffer around the area. This buffer is considered because of the hunting activity and the potential displacement of this group from this area.

Overall, cumulative impacts to recreational use in the JRPA would consist primarily of the displacement of hunters. This would mostly occur during the construction and drilling phase of the project. Additionally, in the long-term some hunters may abandon the area and relocate to an area not impacted by natural gas development. Long-term loss of the hunting activity should be absorbed by the large tracks of public land located in Carbon County. However, most of the disturbance to hunting activity should be short-term and, if big game herds are abundant, hunters would continue utilizing the area.

4.17.9 Visual Resources

The AOI for visual resources would be areas in the visual range of the JRPA. This can vary, and may include areas up to two miles from the project.

Existing visual qualities in the area have already been affected by natural gas development, including road construction and well development. Proposed and reasonable foreseeable development would add to visual impacts in the JRPA. These conditions increase the likelihood that visitors would be dissatisfied with the landscape.

The cumulative impact of the 24 wells on the visual resources would still be consistent with the BLM VRM Class III designation. This designation would not be impacted as the BMPs described in this chapter would mitigate some of the visual impacts associated with this natural gas development.

4.17.10 Cultural Resources

The AOI for cultural resources is the JRPA.

Federal regulations (Section 106 etc.) require that cultural resources are protected from adverse impacts. The BLM requires that all natural gas projects conduct a Class III cultural resource survey before construction can start. Identification of these sites ensures the proper mitigation measure (avoidance or recovery) can be implemented to protect these resources. Cumulative impacts are avoided through the use of these measures. Additionally, the cultural resource data recovered during natural gas projects increases the knowledge of cultural history.

4.17.11 Socioeconomics

The AOI for socioeconomics is Carbon County, and includes the communities of Rawlins and Baggs.

Increased natural gas development in Carbon County would increase the cumulative impacts to housing and social services in the county. However, the small scale of this project should not stress the county housing and services. This project would be completed before the ARPA is fully developed after issuance of the Atlantic EIS Record of Decision. Additionally, the staff working in the Doty Mountain and Red Rim projects would likely work on this project in late 2004 and early 2005. This means the project would not require that new workers be brought into the area to complete the project. A total of 16-36 full-time workers would be employed during the construction and drilling phase of the project.

The displacement of hunters, particularly those guided by outfitters could cumulatively impact this part of the Carbon County economy. Hunting revenue represents a significant part of the economy during the fall. If hunters and outfitters are displaced from JRPA development, they could relocate to another part of Wyoming not affected by natural gas activity.

Overall, the current natural gas activity represents an important source of government revenue, employment, and retail sales. This is a beneficial cumulative impact of increasing natural gas development in Carbon County.

4.17.12 Transportation

The AOI for transportation is the I-80 corridor in Carbon County and access roads to the JRPA.

CBNG development in the JRPA would increase traffic on I-80 and access roads. However, these roads would be able to handle the increased traffic and no change to the level of service would occur.

With the increase in traffic on Twentymile Road, long-term maintenance requirements may increase. However, these costs would be offset by the increased county revenue received from the project.

4.17.13 Health and Safety

The AOI for health and safety would be the JRPA.

A potential exists for increased risks to workers and the public resulting from natural gas development activities and increased traffic. This increased risk would primarily occur during the construction and drilling phase of the project, when most of the activity would occur in the JRPA. These impacts would be short-term and minimal because of the small scale of the development.

4.17.14 Hazardous Materials

The AOI for hazardous materials is the JRPA.

Cumulative impacts for hazardous materials would result from potential contamination of the area resulting from project activities. This impact is minimized through adherence to the strict BLM guidelines for the storage and handling of hazardous materials. Additionally, these guidelines require that if stored on site, and a spill occurs, it must be cleaned up immediately and the BLM notified. It is not expected that any hazardous substances will be stored on-site, although small quantities of fuel and oil maybe kept on-site.

4.17.15 Noise

The AOI for noise would be the JRPA.

Increased noise would result from the construction activities and during operations, particularly the compressor site. This introduction of noise has the potential in the short-term to displace wildlife, particularly greater sage-grouse and big game. In the long-term, if anthropogenic sources of noise do not exceed 10 dBA above natural ambient or background noises measured at an occupied lek, then wildlife may become acclimated to the noise and return to normal activity in the area. This may be obtained through the use of mufflers or other proven methods to reduce or baffle sound placed on compressors and noise producing facilities.

5.0 CONSULTATION AND COORDINATION

5.1 CONSULTATION AND COORDINATION

An environmental analysis is prepared when a federal government agency considers approving an action within its jurisdiction that may impact the human environment. An environmental analysis aids federal decision makers by presenting information on the physical, biological, and social environment of a proposed project and its alternatives. The first step in conducting an environmental analysis that meets the requirements of NEPA is to determine the scope of the project, the range of action alternatives, and the impacts to be included in the document.

The Council on Environmental Quality (CEQ) regulations (40 CFR, Parts 1500-1508) require an early scoping process to determine the issues related to the Proposed Action and alternatives that the analysis should address. The purpose of the scoping process is to identify important issues, concerns, and potential impacts that require analysis. The results of the scoping process are used to focus the analysis on the issues and concerns identified for the proposed project, so that alternatives or mitigation considered can be responsive to the issues and concerns. Alternatives that are not technically or economically feasible or responsive to the issues and concerns are not considered further in the analysis.

The EA documenting the NEPA analysis conducted for the JRPA was prepared by a third-party contractor working under the direction of and in cooperation with the lead agency for the project, BLM Rawlins Field Office in Rawlins, Wyoming.

5.2 PUBLIC PARTICIPATION

A scoping notice was prepared and submitted to the public by the BLM on June 14, 2001, requesting comments on the proposed Atlantic Rim Natural Gas Project. Scoping documents were sent out to the public listed on the BLM mailing list, as well as organizations, groups, and individuals that requested a copy of the scoping document.

As part of the scoping process, the interim drilling programs proposed by the Companies were included in the scoping notice. The scoping period ended on July 25, 2001. During preparation of the EA, the BLM and the consultant interdisciplinary team have communicated with, and received or solicited input from various federal, state, county, and local agencies, elected representatives, environmental and citizens groups, industries, and individuals potentially concerned with issues regarding the proposed exploratory drilling activities. The contacts made are summarized in the following sections.

The following organizations and individuals either provided comment or were provided the opportunity to comment during the scoping period.

FEDERAL OFFICES

U.S. Bureau of Land Management, Wyoming State Office
U.S. Congresswoman Barbara Cubin
U.S. Senator Mike Enzi

U.S. Senator Craig Thomas
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

STATE AGENCIES

Governor Dave Freudenthal
State Representatives
State Senators
State Engineer's Office
Wyoming Department of Environmental Quality
Wyoming Department of Transportation
Wyoming Game and Fish Department
Wyoming Oil and Gas Conservation Commission
Wyoming State Planning Coordinator

COUNTY GOVERNMENT

Carbon County Commissioners
Carbon County Planning Commission

MUNICIPALITIES

Mayor-Baggs
Mayor-Rawlins
Mayor-Wamsutter

NATIVE AMERICAN TRIBES

Northern Arapahoe Tribal Council
Shoshone Tribal Council
Ute Mountain Tribe
Ute Tribal Council
Shoshone-Arapahoe Joint Tribal Council
Uinta-Ouray Tribal Council

GRAZING PERMITTEES

Weber Ranch
Montgomery Livestock Company
Salisbury Livestock Company
Stratton Sheep Company
Three Forks Ranch Corporation
Sam Morgan
Mike Sheehan
Robert Orchard
H.B. Lee

Matt Weber
Espy Livestock
Jack Creek Land and Cattle Company
PH Livestock Company

LEASE AND ROW HOLDERS

Benson-Montin-Greer
KCS Mountain Resources, Inc.
Merit Energy Company
North Finn, LLC
P&M Petroleum Management
Stone & Wolf, LLC

LANDOWNERS

The scoping notice was sent to 111 landowners potentially affected by the proposal.

LOCAL MEDIA

Casper Star-Tribune
Rawlins Daily Times
Rock Springs Rocket Miner
Wyoming State Journal
Wyoming State Tribune/Eagle
Gillette News-Record
Northwest Colorado Daily News
KRAI- Craig, Colorado
KRAL- Rawlins
KRKK- Rock Springs
KSIT- Rock Springs
KTWO- Casper
KTWO TV- Casper
KUWR- University of Wyoming

OTHER AGENCIES, INDUSTRY REPRESENTATIVES, INDIVIDUALS, AND ORGANIZATIONS

Audubon Society
National Wildlife Federation
Wilderness Society
Carbon County Stockgrowers
The Nature Conservancy
Wyoming Association of Professional Archaeologists
Field Museum of Natural History, Department of Geology
Independent Petroleum Association of Mountain States
Montana Oil Journal
Murie Audubon Society
Petroleum Association of Wyoming

Sierra Club
Wyoming Far Bureau Federation
Wyoming Outdoor Council
Wyoming Public Lands Council
Wyoming Stockgrowers Association
Wyoming Wildlife Federation
Wyoming Woolgrowers Association
Vern Brodsho
Ivan Herold
Little Snake River Conservation District

5.3 LIST OF PREPARERS

The following tables identify the core BLM Interdisciplinary Team (IDT) (**Table 5-1**) and the consultant IDT (**Table 5-2**) who were principally involved in preparing this EA.

Table 5-1
BLM Interdisciplinary Reviewers

Name	Responsibility
BLM Team	
Larry Jackson	BLM IDT Lead/Natural Resource Specialist
Dave Simons	Atlantic Rim EIS Coordinator
Ramona Trapp	Cultural Resources
Krystal Clair	Visual Resources/Recreation
Bob Lange	Water Resources
Bob Hartman	Petroleum Engineering, Geology
Susan Foley	Soils and Vegetation
Cheryl Newberry	Range Resources
Frank Blomquist	Wildlife/T&E Issues
Mike Bower	Fisheries Biologist; Riparian/Wetland
Mike Robinson	Realty Specialist

Table 5-2
Consultant Interdisciplinary Team EA Preparers

Name	Affiliation	Area of Expertise and Responsibility
Principal Interdisciplinary Team		
Robert Belford	PBS&J	Project Manager
Francesca Liccione	PBS&J	Environmental Scientist
Chris Miller	PBS&J	Environmental Planner
Mike Horvath	PBS&J	Environmental Planner
Technical Support Team		
Larry Hayden-Wing	Hayden-Wing Associates	Wildlife
Travis Olson	Hayden-Wing Associates	Wildlife
Larry Bennett	Hayden-Wing Associates	Vegetation/Wetlands
Jana Pastor	Western Archaeology	Cultural Resources

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Appendix A
Master Surface Use Plan and Conditions of Approval

MASTER SURFACE USE (MSUP)

JOLLY ROGER ALPHA Pod

OPERATORS:
Warren E & P, Inc.
Anadarko E & P Company

Surface Use Program and Plan of Development for the subject wells listed below:

Lease WYW-148977

AR Federal 1990-SE 32	1277	FEL	1310	FSL	SE/4	32	19N	90W
AR Federal 1990-SW 32	1582	FSL	1409	FWL	SW/4	32	19N	90W

Lease WYW-148973

AR Federal 1890-NE 6	1208	FNL	1300	FEL	NE/4	6	18N	90W
AR Federal 1890-SE 6	1308	FSL	1092	FEL	SE/4	6	18N	90W
AR Federal 1890-NW 4	1502	FNL	1487	FWL	NW/4	4	18N	90W
AR Federal 1890-SW 4	1437	FSL	1125	FWL	SW/4	4	18N	90W

Lease WYW-129066

AR Federal 1890-NE 8	1262	FNL	1304	FEL	NE/4	8	18N	90W
AR Federal 1890-SW 8	1198	FSL	1433	FWL	SW/4	8	18N	90W
AR Federal 1890-SE 8	1320	FSL	1125	FEL	SE/4	8	18N	90W
AR Federal 1890-NE 18	1246	FNL	1411	FEL	NE/4	18	18N	90W

Plan of Development for the facilities listed below:

Proposed Road ROWs on BLM lands to Fee Gas Wells

Fee Well:	**Location and Length of Road on Federal land:**
AR Fee 1890-NE 7:	NW NW 8-18N-90W, approximately 100 feet
AR Fee 1890-SE 7:	SW SW 4-18N-90W, approximately 500 feet
	SW SE 8-18N-90W, approximately 1300 feet
	NE NE 18-18N-90W, approximately 1100 feet
AR Fee 1990-SE 31:	NE NE 6-18N-90W, approximately 800 feet
AF Fee 1990-SW 33:	NE SE 32-19N-90W, approximately 1300 feet

Proposed ROW (BLM surface ownership lands): Buried Electrical Utility, Water and Gas Lines in T18N and T19N R90W (all pipeline corridors will parallel roads)

The MSUP contains surface operating procedures for the Companies' Federal Applications for Permits to Drill (APDs), as required under Onshore Order No. 1. The enclosed **Project Map** shows all proposed interim drilling activities associated with the Jolly Roger Alpha Pod. Additional information on each federal well is contained in the **BLM APD Form 3160-3** and **Well Survey Plat**.

This MSUP is intended to serve as the application for the gas and water lines, access roads to well locations, and electric lines in the Pod. Roads and gathering lines will occupy a 80 foot

wide common corridor. Roads will require a 50-foot wide disturbance. Gas-gathering and water-gathering lines will require a 20-foot wide disturbance and electric lines a 10-foot wide disturbance. All disturbances located in the same corridor will overlap each other to the maximum extent possible, while maintaining sound construction and installation practices. Roadways will be used as working space for installation of gathering lines. Please refer to the schematic for the layout of pipelines and roads.

An allocation meter will be used to measure raw produced gas volumes for each well in the Pod. A sales meter will be located downstream of the final compressor and dehydration unit, at the compressor station, and will be used to measure dry salable-quality gas. A request for variance from Onshore Order No. 5, if needed, along with a description of the measurement equipment, will be submitted in a Sundry Notice if the wells are deemed producible.

During well testing associated with this project, natural gas, to the extent it is produced, will be vented or flared on-location in accordance with the applicable BLM Onshore Orders, Notices To Lessees, and WOGCC regulations, and authorized by the WOGCC and the BLM in Sundry Notices. During testing, produced water from the proposed wells will be transported off-location to an approved injection well for disposal.

1. EXISTING ROADS AND TRAVELWAYS

The project area is accessible from Rawlins, Wyoming, by traveling approximately 16 miles south on Carbon County 605 (Twentymile Road), which intersects Interstate 80 (I-80) near Rawlins. In Section 3, T18N R90W, County Road 605 is intersected by the Fillmore Ranch road which runs southwest for approximately .75 mile and then west for approximately 1 mile. This road provides access into the project area.

Maintenance of the roads used to access the well locations will continue until final abandonment and reclamation of the well locations occur. A regular maintenance program will include, but is not limited to, blading, ditching, culvert installation and cleanout, and gravel surfacing where excessive rutting or erosion may occur. The existing roads will be maintained in a safe and usable condition.

Culverts (a minimum of 18-inches in diameter) will be placed in the existing BLM roads as the need arises or as directed by BLM's Authorized Officer. (Refer to individual well area maps).

2. PROPOSED ACCESS ROUTES

Well Access

New access roads have been sited to avoid sensitive resource areas, such as leks, and areas susceptible to increased resource damage from the proposed project, such as areas of steep terrain or poor vegetative cover.

Newly constructed access roads will be crowned, ditched, and graveled. All equipment and vehicles will be confined to identified travel corridors and other areas specified in this MSUP.

The access roads will be surfaced with an appropriate grade of aggregate or gravel to a depth of 4 inches before the drilling equipment or rig is moved onto the pad.

Unless otherwise exempted, free and unrestricted public access will be maintained on the access road. Access roads will be maintained in a safe and usable condition. A regular maintenance program will include, but is not limited to, blading, ditching, installing or cleaning culverts, and surfacing.

All existing and proposed access roads will be constructed to minimum standards for a BLM Resource Road, as outlined in BLM Manual 9113. The minimum travelway width of the road will be 14 feet with turnouts. No structure will be allowed to narrow the road top. The inside and outside slope will be 4:1. Turnouts will be spaced at a maximum distance of 1,000 feet and will be intervisible.

Wing ditches will be constructed as deemed necessary to divert water from the road ditches as outlined in BLM Manual 9113 and the 10 erosion index shall be used. Wing ditches will be constructed at a slope of .5 percent to 1 percent.

Topsoil and vegetation will be windrowed to the side of the newly constructed access roads. After the roads are crowned and ditched, the topsoil will be pulled back onto the cut slopes of the road right-of-way so no berm is left at the top of the cut slope.

Drainage crossings on the access routes will be low water crossings or crossings using culverts. Low water crossings would be used in shallow channel crossings. Crossings of the main channel would consist of excavating an area approximately 4 feet deep under the travelway and filling it with rock and gravel to the level of the drainage bottom. Channel banks on either side of these crossings would be cut down to reduce grade where necessary. Culverts would be installed on smaller, steeper channel crossings. Rip-rap may be added at the outlet of each culvert to minimize erosion. Topsoil would be conserved before channel crossing construction occurs. Additional culverts would be placed as the need arises.

Culverts will be covered with a minimum of 12 inches of fill or one-half the diameter of the pipe, whichever is greater. The inlet and outlet will be set flush with existing ground and lined up in the center of the draw. Before the area is backfilled, the bottom of the pipe will be bedded on stable ground that does not contain expansive or clay soils, protruding rocks that would damage the pipe or unevenly sized material that would not form a good seat for the pipe. The site will be backfilled with unfrozen material and rocks no larger than 2 inches in diameter. Care will be exercised to thoroughly compact the backfill under the haunches of the conduit. The backfill will be brought up evenly in 6-inch layers on both sides of the conduit and thoroughly compacted. A permanent marker will be installed at both ends of the culvert to help keep traffic from running over the ends. Culverts will be installed in a manner that minimizes erosion or head-cutting and may include rip rapping or other measures as required. Additional culverts will be placed in the access road as the need arises.

The access roads will be winterized by providing a well-drained travelway to minimize erosion and other damage to the roadway or the surrounding public land. Construction activity or

routine maintenance will not be conducted using frozen or saturated soil material or during periods when watershed damage is likely to occur.

No construction or routine maintenance activities will be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 4 inches deep, the soil will be deemed too wet to adequately support construction equipment, and construction and maintenance will be temporarily suspended.

The written approval of the Authorized Officer will be obtained before snow removal is undertaken outside the new and existing roadways. If approval is given, equipment used for snow removal operations outside the road ditches will be equipped with shoes to keep the blade off the ground surface. Special precautions will be taken where the surface of the ground is uneven to ensure that equipment blades do not destroy the vegetation.

If drilling is productive, all access roads to the well site would remain in place for well servicing (such as maintenance and improvements). Any portions of the ROW for the access road that are no longer needed would be reclaimed. The outside ditch cuts would be seeded and reclaimed.

3. LOCATION OF EXISTING WELLS

Eight permitted water wells are located within 1 mile of the project area **(Permitted Water Wells Within 1 Mile of the Jolly Roger Alpha Project Area)**.

The enclosed **Project Map** shows locations of disposal, drilling, producing, injection, and abandoned oil and gas wells within 1 mile of the Jolly Roger Alpha Pod wells. The well locations were obtained by a search of the WOGCC website.

PERMITTED WATER WELLS WITHIN 1 MILE OF THE JOLLY ROGER ALPHA PROJECT AREA

Permit No.	Sec-Tns-Rng	Qtr/Qtr	Applicant	Facility Name	Use	Yield (gpm)	Well Depth	Static Depth
P108373W	10-18N-90W	NE SW	USDI, BLM, PH Livestock Co.	BLM Alamosa #1	Stock	10	4	-4
P108375W	16-18N-90W	SESE	USDI, BLM, PH Livestock Co.	Alamosa #3	Stock	15	4	-4
P131616W	6-18N-90W	SENW	P H Livestock Co.	Fillmore Ranch #1	Domestic Stock	15	100	10
P55867W	5-18N-90W	NENW	P H Livestock Co.	Fillmore #3	Stock	10	300	35
P96832W	15-18N-90W	NWSW	P H Livestock Co.	Alamosa #1	Stock	5	4	-4
P96833W	15-18N-90W	NWNE	P H Livestock Co.	Slide Draw #1	Stock	5	4	-4
P136890W	31-19N-90W	NWSE	P H Livestock Co.	Fillmore #4	Stock	10	220	135
P34582W	1-18N-91W	SE NW	P H Livestock Co.	CBW 3	Monitoring	0	190	70

4. LOCATION OF EXISTING AND/OR PROPOSED FACILITIES, IF WELLS ARE PRODUCTIVE

On Well Pad

Wellhead facilities would be installed if the wells are productive. Natural gas and produced water would be collected and transported from the wellhead via buried pipelines.

The long-term surface disturbance at the location of each productive well would encompass approximately 0.25 acre, including cut and fill slopes. Typically, only the production facilities at the well site would be fenced or otherwise removed from existing uses. A loop road or a small, graveled pad area would provide a safe turnaround area for vehicles.

The wellhead facilities would be contained within an area covering approximately 15 feet by 15 feet. The surface equipment at each well will consist of the wellhead, a pump panel, and an insulated wellhead cover. Additionally, a vertical separator at some well sites would separate gas from the water stream. Each productive well is expected to require installation of an electric submersible pump below ground level, which will be used to produce water necessary to lower pressure within the coal seams.

All production facilities installed on location that have the potential to leak or spill oil, glycol, produced water, or other fluid, which may constitute a hazard to public health or safety, shall be placed within an appropriate containment or diversionary structure. The structure shall be sufficiently impervious to oil, glycol, produced water, or other hazardous fluid. It shall be

installed so that any spill or leakage would not drain infiltrate, or otherwise escape to ground water, surface water, or navigable waters before cleanup is completed.

The Companies will paint structures at wells and central facilities with flat colors that blend with the adjacent undisturbed terrain. The paint used will be a color specified by the BLM. This measure does not apply to structures that require safety coloration in accordance with the requirements of the Occupational Safety and Health administration (OSHA).

Electricity would be used to power pumps during well development and to initiate and maintain production. A centrally located electrical generator located at the compressor station will be utilized to provide electricity to the wells. The distribution system will consist of utility lines buried in the road/pipeline corridor. These lines would be installed in trenches approximately 3 feet deep.

Off Well Pad

Pipelines (Gathering Lines and Delivery Pipeline)/Compressor Station/ Water Handling and Disposal Facilities/Injection Wells/Tanks

Pipelines
The corridors for the gathering systems will parallel access roads. ROWs located in the same corridor will overlap each other to the maximum extent possible, while maintaining sound construction and installation practices. Where ROW corridors are located along a road, working space for installation of facilities will be along the road.

The exterior boundaries of the pipeline right-of-way shall be marked with stakes and/or lath at 100 foot intervals. The tops of the stakes or laths shall be painted or flagged in a distinctive color, and remain in place until final construction cleanup is completed.

Clearing along the pipeline route shall be limited to removal of above ground vegetative parts within the area comprising the ditch and backfill.

Trenches will be excavated to install the flowlines and electrical lines. (Refer to the attached schematic for layout of lines) Trenches excavated for well gathering lines and electrical lines (which would require ROWs of 20 feet in width for gas lines and water lines, and 10 feet in width for electrical lines) which would be reclaimed as soon as practical after trenching and backfilling are completed. About 8.5 miles of gathering lines would be located on BLM surface ownership lands.

A gas-gathering pipeline system (low pressure) would be constructed from the wellheads to the compressor station. This system would use high-density polyethylene (HDPE) pipe, starting with 4-inch diameter pipe at the wellhead and graduating up to 20-inch diameter pipe at the inlet to the compressor. Although there is no plan to use additional area for installation of the larger size pipe, should additional pipeline corridor right-of-way width be required on Federal land, application will be made to the BLM.

A produced water-gathering pipeline system (low pressure) would be constructed from the wellheads to the centralized facilities for injection. This network of water lines would use 4-inch through 20-inch diameter pipe made of HDPE. Although there is no plan to use additional area for installation of the larger size pipe, should additional pipeline corridor right-of-way width be required on Federal land, application will be made to the BLM.

All produced water used to test the integrity of the gas delivery pipeline (500 barrels [bbls] or 21,000 gallons) would be injected in injection wells. Pipeline corridors would be reclaimed as soon as practical after construction of the pipeline is complete.

Where it is necessary to remove above ground vegetation, the top 6-inches of top soil material will be stripped, windrowed, and stockpiled to the side and segregated if the pipeline to be installed is 8-inches or greater O.D. Top soil material will not be mixed or covered with subsurface material. After construction cut and fill slopes will be waterbarred or regraded to conform to the adjacent terrain as specified by BLM.

A maximum of 1000 feet unattended or unprotected open trench shall be allowed at any given time. Construction trenches and other openings left overnight shall be covered. Covers shall be secured in place and strong enough to prevent livestock or wildlife from falling through. During the period when a trench is open, warning devices, such as signs, flares, or warning lights shall be posted to warn the public of the hazard.

Drainage crossings shall be constructed to prevent any blocking, diversion, or restriction of the existing channel. Material removed shall be stockpiled for use in reclamation of the crossing.

In order to minimize surface disturbance, the operator will use wheel trenchers (ditchers) or ditch witches, where possible, to construct all pipeline trenches associated with this project. Track hoes or other equipment will be used where topographic or other factors require their use. Trenches shall be compacted during backfilling.

Construction related traffic shall be restricted to approved routes. Cross-country vehicle travel shall not be allowed.

No hydrostatic testing water shall be discharged to the surface.

Water Handling and Disposal Facilities and Injection Wells

Within 90 days of initial production start-up, the operator will submit an analysis of the produced water to the BLM's Authorized Officer. Approval of this Pod includes approval for Onshore Order No. 7 to dispose of produced water. Produced water will be injected into an authorized injection well. Any changes in the produced water disposal method or location must receive written approval from BLM's Authorized Officer before the changes take place.

Water produced at the well sites will be pumped to an injection well on private land for disposal.

5. LOCATION AND TYPE OF WATER SUPPLY FOR DRILLING

Water to drill the first well will be trucked using County Road 605 and Fillmore Ranch Road to the Jolly Roger Alpha project area from the Red Rim pod water facilities located in T20N R89W.

Water produced from project wells will be transported to nearby drilling locations and used to drill subsequent wells.

Any changes in the water source or method of transportation must receive written approval from BLM's Authorized Officer before the changes take place.

6. CONSTRUCTION MATERIALS

Construction materials (mineral material aggregate suitable for surfacing material) will be purchased from a nearby private source or a local supplier having a permitted source of materials in the area. No construction materials will be removed from federal and/or Indian lands without prior approval from the BLM.

7. METHODS FOR HANDLING WASTE DISPOSAL

Drill cuttings (rock fragments generated during drilling) will be produced during drilling of the borehole. Cuttings will be buried in the reserve pit upon closure of the reserve pit.

No oil or other oil-based drilling additives, chromium/metals-based muds, or saline muds will be used during drilling of these wells. Only fresh water, biodegradable polymer soap, bentonite clay, and non-toxic additives will be used in the mud system. Should unexpected liquid petroleum hydrocarbons (crude oil or condensate) be encountered during drilling or well testing, all liquid petroleum hydrocarbons will be contained in test tanks on the well site.

A portable, self-contained chemical toilet will be provided on location during drilling and completion operations. Upon completion of operations, or as required, the contents of toilet holding tanks will be disposed of at an authorized sewage treatment and disposal facility. Disposal will be in accordance with State of Wyoming, Carbon County, and BLM requirements regarding sewage treatment and disposal. The Companies will comply with all state and local laws and regulations pertaining to disposal of human and solid wastes.

No trash will be placed in the reserve pit. All refuse (trash and other solid waste including cans, paper, cable, etc.) generated during construction, drilling, and well testing activities will be contained in an enclosed receptacle, removed from the drill locations promptly, and hauled to an authorized disposal site.

Immediately after removal of the drilling rig, all debris and other waste materials not contained within trash barrels will be cleaned up and removed from the well location. No potentially adverse materials or substances will be left on the drill locations.

Hazardous Materials Management

All project-related activities involving hazardous materials will be conducted in a manner that minimizes potential environmental impacts. An on-site file will be maintained containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds, or substances that are used in the course of construction, drilling, completion, production, and reclamation operations. Netting will be placed over any pits that may contain hazardous substances (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 101(14)), as determined by visual observation or testing. The mesh diameter shall be no larger than 1 inch.

No hazardous substance, as defined by CERCLA, will be used in the construction or drilling operations associated with these wells. No Resource Conservation and Recovery Act (RCRA) hazardous wastes will be generated by well-drilling operations. The term "hazardous materials" as used here means: (1) any substance, pollutant, or containment (regardless of quantity) listed as hazardous under CERCLA of 1980, as amended 42 U.S.C. 9601 et seq., and the regulations issued under CERCLA; (2) any hazardous waste as defined in RCRA of 1976, as amended; and (3) any nuclear or nuclear byproduct as defined by the Atomic Energy Act of 1954, as amended, 42 U.D.C. 2001 et seq. The operator will be required to provide a referenced list of hazardous materials that could be used, produced, transported, disposed of, or stored on the well location including a discussion on the management of the hazardous materials.

Any spills of oil, gas, or any other potentially hazardous substance will be reported immediately to the BLM, landowner, local authorities, and other responsible parties and will be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

8. ANCILLARY FACILITIES

Several self-contained travel-type trailers may be used onsite during drilling operations. No facilities other than those described in this MSUP will be constructed to support the operations associated with the wells.

9. WELL SITE LAYOUT

Information on each federal well is contained in the **BLM APD Form 3160-3, Well Survey Plat**, **Typical Drill Site** and **Drill Pad Cross Section** on file with BLM. The cross section shows the orientation of the drill pad with respect to the topographic features (cut and fill), facilities, and access to the pad.

At each drill location, surface disturbance will be kept to a minimum. The areal extent of each drill pad is approximately 200 feet by 300 feet. Each drill pad will be leveled using cut and fill construction techniques. Prior to constructing the drill pad the top 6 to 8 inches of soil (more if available) and associated vegetative material will be removed and stockpiled. A water diversion ditch will be constructed around the up slope side of the well pad to divert storm water away from each pad. No spoil material shall be pushed into drainages.

Each reserve pit will be approximately 10 feet deep (including 2 feet of freeboard), and will be 30 feet wide and 75 feet long (at the surface). Each pit will be excavated within the "cut area" of the drill site to minimize any potential for slope failure. Each pit will be designed to prevent collection of surface runoff and will be closely monitored to ensure no pit overflows occur. The reserve pit will be open for an estimated 2 to 8 weeks to allow for evaporation of pit fluids. During this time the pit will be closed off from wildlife and livestock by two strands of barbed wire above a 32-inch woven wire fence. The reserve pit will be fenced on three sides during drilling, and the working side will be fenced immediately after the drilling rig is moved. Fencing will meet the following specifications.

The woven wire shall be no more than four inches above the ground. The first strand of barbed wire shall be about three inches above the woven wire. Total height of the fence shall be at least 42-inches.

Corner posts shall be cemented and/or braced in such a manner to keep the fence tight at all times. Standard steel, wood, or pipe posts shall be used between the corner braces. The maximum distance between any two posts shall be no greater than sixteen feet. All wire shall be stretched using a stretching devise before it is attached to the corner posts.

Netting will be placed over any pits that have been identified as containing oil, as determined by visual observation or testing. The mesh diameter will be no larger than 1 inch. For the protection of livestock and wildlife, all pits and open cellars will be fenced. Fencing shall be in accordance with BLM specifications.

10. PROGRAMS FOR RECLAMATION OF THE SURFACE

BLM surface ownership lands that contain disturbed areas or facilities that are no longer needed would be reclaimed at the earliest opportunity in accordance with applicable regulations and agency guidance.

As soon as practical after the conclusion of drilling and testing operations, unproductive drill holes will be plugged and abandoned and site and road reclamation will commence. A joint inspection of the disturbed area to be reclaimed may be requested. The primary purpose of this inspection shall be to review the existing, or agree upon a revised final reclamation and abandonment plan. The BLM will be notified prior to commencement of reclamation operations. A Notice of Intent to Abandon will be filed for final recommendations regarding surface reclamation.

After abandonment of nonproductive wells, all wellhead equipment that is no longer needed will be removed, and the well sites will be restored.

Any areas, including the drilling locations, reserve pits, or access routes, that are disturbed by earthwork will be recontoured to a natural appearance as near to the original contour as possible as soon as practical after the conclusion of operations. Any flowline trenches that may be constructed will be backfilled completely.

Pits containing drilling muds and fluids shall be allowed to dry. Fluids remaining after two years shall be moved to an approved site. Other options, if approved by the Authorized Officer, may include fly-ash solidification or sprinkler evaporation over the pit containing the fluid.

The reserve pit, upon being allowed to properly dry, shall be backfilled and compacted with a minimum cover of five feet of soil, void of any topsoil, vegetation, large stones, rocks or foreign objects. Soils that are moisture laden and saturated, partially or completely frozen shall not be used for backfill or cover. The pit area shall be mounded to allow for settling and to promote positive surface drainage away from the pit.

Should the well become productive, all disturbed areas not needed for production operations shall be re-contoured and re-vegetated as outlined in the MSUP, under an interim or temporary reclamation plan. This shall be performed after placing the well into production but within two years of completion of drilling. If not previously reclaimed, the access road and pipeline right-of-way may be included in this reclamation. Re-contouring involves bringing all construction material from cuts and fills back onto the well pad and site, and reestablishing the natural contours where desirable and practical. Fill and stockpiled soil no longer needed or necessary to the operation shall be spread on the cut slopes and covered with stockpiled topsoil. Final contouring shall blend with and follow as closely as possible the natural terrain and contours of the original site and surrounding areas. The production pad and facilities shall occupy as small an area as possible, but nor larger and 0.8 acres unless otherwise approved by the BLM Authorized Officer.

Should the well be put into production or upon final abandonment of the well, fencing of the reseeded well site will be erected as necessary to exclude grazing and to help vegetation success.

After recontouring the site to the original contour that existed prior to pad construction, final grading and replacement of topsoil over the entire surface of the well site and access road will be conducted. The area will be ripped to a depth of 18-24 inches on 18-24-inch centers.

The surface soil material shall be pitted with small depressions to form longitudinal depressions 12-18 inches deep. The entire area will be uniformly covered with the depressions constructed perpendicular to the natural flow of water.

The travelway of the access road to be rehabilitated will be ripped to a depth of 18 inches, recontoured to approximate the original contour of the ground and seeded in accordance with the reclamation portions of the MSUP.

Water control structures will be designed and constructed at drainage crossings to prevent excessive erosion within the drainage.

Waterbars will be constructed on all disturbed areas to: (1) simulate the imaginary contour lines of the slope with a grade of 1-2 percent; (2) drain away from the disturbed areas; and (3) begin and end in undisturbed vegetation or soil.

Recontoured areas will be graded to be outsloped, and waterbreaks will be constructed where needed to avoid concentrating surface waters and producing gullies. The land surface will be left "rough" after recontouring to ensure that the maximum surface area will be available to support the reestablishment of vegetative cover.

All topsoil conserved during earthwork will be redistributed evenly and left "rough" over these recontoured areas. BLM goals for vegetative cover will guide revegetation efforts. Common goals are erosion control, weed control, palatable and nutritious forage for livestock and wildlife, and visual aesthetics.

Seeding will occur in the fall after September, prior to ground frost, or in the spring after frost has left the ground. The seed mixture, including fertilizer and mulching requirements, seeding depth, and seed drilling specifications, have been developed in consultation with the BLM. Seed will be drilled on the contour using a seed drill equipped with a depth regulator to ensure even depths of planting. Seed will be planted between one-quarter to one-half inch deep. The anticipated seed mix to be applied and rates of application are listed below.

SEED MIX FOR RECLAMATION

Species	Rate of Application*
Western Wheatgrass	4 lbs./Acre
Green Needlegrass	4 lbs./Acre
Indian Ricegrass	4 lbs./Acre
Sandberg Bluegrass	0.5 lbs./Acre
Gardner's Saltbush	1 lb./Acre
Winterfat	0.5 lbs./Acre

These rates of application apply to pure live seed (PLS) that is used for drill seeding. For broadcast seeding, the rates of application will be doubled.

11. SURFACE OWNERSHIP

U.S. Bureau of Land Management
Rawlins Field Office
1300 North Third
Rawlins, Wyoming 82301-2407
(307) 328-4200

P.H. Livestock Co.
Niels Hansen, President
P.O. Box 937
Rawlins, WY 82301
(307) 324-3203

12. OTHER INFORMATION

The Companies are the lessee or operator for the federal oil and gas leases associated with this MSUP and these APDs.

No slopes in excess of 25 percent would be affected by this proposal. No activities are planned near existing highways, railroads, pipelines, or powerlines. There are no occupied buildings or residences within one-quarter mile of the proposed drill sites.

Any road crossings of dry drainages, riparian, or other wetland areas will use appropriate Best Management Practices (BMP) to minimize impacts to these areas.

Dust abatement using produced water will comply with all applicable WOGCC, WDEQ or BLM requirements. Only water suitable for livestock use would be used for dust abatement. Only disturbed areas will be sprayed. Spraying will be done to reduce runoff and channeled flow.

The presence, distribution, and density of noxious weeds in the project area will be monitored by the Companies. The well access roads and well pads will be inspected regularly to ensure that noxious weeds do not become established in newly disturbed areas. Control methods will be based on available technology, taking into consideration the weed species present. Methods of noxious weed control may include revegetation of disturbed areas to reduce the potential for and success of weed establishment, mowing, hand-pulling, or application of appropriate herbicides. The control methods shall be in accordance with guidelines established by the Environmental Protection Agency (EPA), BLM, and state and local authorities or agencies.
Prior to the use of any herbicides or pesticides on Federal lands, the Companies will obtain written approval from the BLM Authorized Officer. The Companies will also prepare and submit a proposal and plan to the BLM Authorized Officer for an annual weed control program that satisfies the requirements established in the MSUP and any additional Conditions of Approval.

A cultural/historical resource inventory has been conducted on the public lands by a qualified archaeologist permitted in Wyoming by the BLM. The findings have been submitted under separate cover. Any additional areas of potential effect identified subsequent to the completion of these reports will be inventoried as specified by the BLM, and a supplemental report will be prepared.

During the construction phase of the well pad and access road, the operator shall have onsite, a qualified inspector other than the dirt contractor to serve as Compliance Coordinator. This individual will be responsible for assuring that all requirements of the MSUP and appropriate Conditions of Approval are enforced.

Approved facilities no longer included within the lease-unit boundaries due to a change in the lease or unit boundary will be authorized with a right-of-way.

The Companies will be responsible for the prevention and suppression of fires or public lands caused by its employees, contractors, or subcontractors. During conditions of extreme fire

danger, surface use operations may be either limited or suspended in specific areas, or additional measures may be required by the Authorized Officer.

Landowner Notification

The Companies have obtained a surface use agreement with the landowner.

13. SITE-SPECIFIC CONDITIONS OF APPROVAL

Wildlife Stipulations

Lease WYW129066 contains a no surface occupancy stipulation in the NW, N2SW of Section 8 to protect sage grouse breeding habitat and a timing limitation stipulation to protect nesting habitat for raptors and greater sage grouse, from February 1 through July 31.

Lease WYW148973 contains a timing limitation stipulation to protect big game crucial winter range from November 15 to April 30 and a timing limitation stipulation to protect nesting habitat for raptors and greater sage grouse, from February 1 through July 31. The lease also contains controlled surface use stipulations: (1) within ¼ mile of a sage/sharp-tailed grouse lek; (2) within Baggs elk crucial winter range special management area; and (3) within the Jep Canyon ACEC.

Lease WYW148977 contains a timing limitation stipulation to protect nesting habitat for raptors and greater sage grouse, from February 1 through July 31, and a controlled surface use stipulation within the Baggs elk crucial winter range special management area.

14. LESSEE'S REPRESENTATIVE AND CERTIFICATIONS

Representative for Anadarko E & P Company

Name:	Cathy Flansburg
Title:	Senior Environmental and Regulatory Analyst
Address:	2515 Foothill Boulevard, Suite 300
City/State/Zip:	Rock Springs, WY 82901
Phone:	(307) 352-3328

Bonding

BLM Nationwide Bond, WY 1280, $150,000

Certification

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill sites and access routes; that I am familiar with the conditions which currently exist; that the statements made in this plan are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed by AEPC and its contractors and subcontractors in conformity with this plan and the terms and conditions under

which it is approved. This statement is subject to the provisions of 18 U.S.C 1001 for the filing of a false statement.

I also certify that AEPC will comply with the provisions of the law or the regulations governing the Federal or Indian right of reentry to the surface under 43 CFR 3814.

I also certify that AEPC has reached or will reach an agreement with the surface owner(s) and surface lessee(s) regarding the requirements for the protection of surface resources and reclamation of disturbed areas and/or damages in lieu thereof, or if an agreement cannot be reached, will comply with the provisions of the law or the regulations governing Federal or Indian right of reentry to the surface under 43 CFR 3814.

I also certify that:

A. All potentially affected landowners having properly permitted water wells with the WSEO within each producible well's Circle of Influence (one-half mile radius) will be offered a Water Well Agreement; and

B. If a Water Well Agreement is not reached with the landowner, AEPC agrees to mitigate the impacts of its producible wells in accordance with State of Wyoming water laws; and

C. Permits to Appropriate Groundwater have been applied for from the Wyoming State Engineer's Office, concurrently with these Applications for Permits to Drill.

I also certify that AEPC shall use its best efforts to conduct its approved operations in a manner that avoids adverse effects on any properties which are listed, or may be eligible for listing, in the National Register of Historic Places (NRHP). If historic or archaeological materials are uncovered during construction, the operator will immediately stop work that might further disturb such materials, and contact the authorized officer (or his/her representative) at the BLM Rawlins Field Office. Any paleontological resources or fossils discovered as a result of operations associated with these wells will be brought to the attention of the authorized officer or his/her representative immediately. All activities in the vicinity of such discoveries will be suspended until notified to proceed by the Authorized Officer.

I also certify that AEPC shall use its best efforts to conduct its approved operations in accordance with the Project-wide Mitigation Measures and procedures outlined in Chapter 2 of the Environmental Assessment (EA) for this project.

By: _____ Date: _____

Cathy Flansburg
Senior Environmental and Regulatory Analyst
Anadarko E & P Company

CONDITIONS OF APPROVAL
Jolly Roger Pod

Lease Number	Well Name	Well Number	Location
Lease WYW-148977	AR Federal	1990 SE 32	T19N R90W Section 32 SE¼
		1990-SW 32	T19N R90W Section 32 SW¼
Lease WYW-148973	AR Federal	1890-NE 6	T18N R90W Section 6 NE¼
		1890-SE 6	T18N R90W Section 6 SE¼
		1890-NW 4	T18N R90W Section 4 NW¼
		1890-SW 4	T18N R90W Section 4 SW¼
Lease WYW-129066	AR Federal	1890-NE 8	T18N R90W Section 8 NE¼
		1890-SW 8	T18N R90W Section 8 SW¼
		1890-SE 8	T18N R90W Section 8 SE¼
		1890-NE 18	T18N R90W Section 18 NE¼

GOVERNMENT CONTACTS

USDI, BUREAU OF LAND MANAGEMENT

Field Office: Rawlins
Address: P.O. Box 2407, Rawlins, Wyoming 82301
Office Hours: 7:45 am to 4:30 pm

Authorized Officer's Designated Representatives:

Assistant Field Manager: (Minerals & Lands)	Clare Miller	Home Phone Work Phone	(307) 324-2372 (307) 328-4245
Petroleum Engineer:	Bob Hartman	Home Phone Work Phone	(307) 321-3439 (307) 328-4254
Petroleum Engineer:	Jon Dull	Work Phone Cell Phone	(307) 328-4227 (307) 321-1687
Pet. Engineer Tech.:	Cole Thomas	Home Phone Work Phone Cell Phone	(307) 328-1901 (307) 328-4249 (307) 320-8594
Pet. Engineer Tech.:	Chuck Ross	Home Phone Work Phone Cell Phone	(307) 324-9123 (307) 328-4230 (307) 320-7778

Pet. Engineer Tech.:	Bill Ashline	Home Phone	(307) 324-6355
		Work Phone	(307) 328-4263
		Cell Phone	(307) 320-7777
Pet. Engineer Tech.:	Bryan Hurst	Home Phone	(307) 324-5066
		Office Phone	(307) 328-4277
		Cell Phone	(307) 320-5414
Resource Specialist:	Larry Jackson	Work Phone	(307) 328-4231

In the event that the Petroleum Engineer named above is not available please contact the following:

Petroleum Engineer:	Stuart Cerovski	Home Phone	(307) 332-2408
		Work Phone	(307) 332-8426

A COPY OF THE APPLICATION FOR PERMIT TO DRILL AND THESE CONDITIONS OF APPROVAL MUST BE FURNISHED TO YOUR FIELD REPRESENTATIVE AND BE AVAILABLE ON SITE.

GENERAL PERMITTING REQUIREMENTS

1. All lease operations are subject to the terms of the lease and the lease stipulations, the regulations of 43 CFR Part 3100, Onshore Oil and Gas Orders, Notices to Lessees (NTL's), the approved APD and any written instructions or orders of the authorized officer. The following requirements are emphasized.

   Abandonment: In the event abandonment of the hole is desired, oral approval may be granted by this office but must be followed within 5 days with a **Notice of Intention to Abandon (Form 3160-5)**. Unless the plugging is to take place immediately upon receipt of oral approval, the BLM Branch of Minerals must be notified at least 24 hours in advance of the plugging of the well in order that a representative can witness the plugging operation. The **Subsequent Report of Abandonment (Form 3160-5)** must be submitted within 30 days after the actual plugging of the wellbore, reporting where the plugs were placed and volumes of cement used, along with copies of the service company invoice and job log.

   The operator shall promptly plug and abandon each newly completed, recompleted or producing well which is not capable of producing in paying quantities. No well may be temporarily abandoned for more than 30 days without prior approval of the authorized officer. When justified by the operator, the authorized officer may authorize additional delays, no one of which may exceed an additional 12 months. Upon removal of drilling or producing equipment from the site of a well, which is to be permanently abandoned, the surface of the lands disturbed shall be reclaimed in accordance with a plan first approved or prescribed by the authorized officer.

   Completion Report: If the well is completed as a dryhole or as a producer, **Well Completion or Recompletion Report and Log (Form 3160-4)** must be submitted within 30 days after completion of the well or after completion of operations being performed, in accordance with **43 CFR 3160**. Copies of all logs, core descriptions, core analyses, well test data, geologic summaries, sample descriptions, daily drilling reports, daily completion reports, and all other surveys or data obtained and compiled during the drilling, completion, and/or workover operations, will be filed with **Form 3160-4**.

2. Approval of this APD does not warrant that any party holds equitable or legal lease title.

3. This permit is valid for a period of one year from the day of approval or until lease expiration/termination,

whichever is shorter. If the permit terminates, any surface disturbance created under the application shall be reclaimed in accordance with the approved plan.

4. The spud date shall be reported to the BLM authorized officer's representative within 24 hours following spudding. A follow-up report on Form 3160-5 confirming the date of spud shall be promptly submitted to this office within 5 working days from date of spud.

5. Verbal notification shall be given to the BLM authorized officer's representative at least 24 hours in advance of pluggings, DST's and/or other formation tests, BOP tests, running and cementing casing (other than conductor casing), and drilling over lease expiration dates.

6. Verbal notification shall be given to the BLM's resource specialist at least 48 hours in advance of access road/well pad construction, seeding, and the initiation of any reclamation work.

7. Operations that deviate from the approved APD shall receive prior written approval from the authorized officer. Emergency approval may be obtained orally but such approval does not waive the written report requirement.

8. All lease exploration, development, production and construction operations shall be conducted in a manner which conforms with all applicable Federal, State, and local laws and regulations.

9. Historic, Cultural, and Paleontological Resources

The operator shall be responsible for informing all persons associated with this project that they shall be subject to prosecution for damaging, altering, excavating or removing any archaeological, historical, or vertebrate fossil objects or site. If archaeological, historical, or vertebrate fossil materials are discovered, the operator shall suspend all operations that further disturb such materials and immediately contact the authorized officer. Operations shall not resume until written authorization to proceed is issued by the authorized officer.

Within five (5) working days, the authorized officer will evaluate the discovery and inform the operator of actions that will be necessary to prevent loss of significant cultural or scientific values.

The operator shall be responsible for the cost of any mitigation required by the authorized officer. The authorized officer will provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the authorized officer that the required mitigation has been completed, the operator shall be allowed to resume operations.

10. Hazardous Waste: Those wastes that qualify as **exempt,** under the Resource Conservation and Recovery Act (RCRA), Oil and Gas Exemption, may be disposed of in the reserve pit. *Generally, oil or gas wastes are exempt if they 1) have been sent downhole and then returned to the surface during oil/gas operations involving exploration, development, or production, or 2) have been generated during the removal of produced water or other contaminants from the oil/gas production stream.* The term hazardous waste, as referred to above, is defined as a listed (40 CFR 261.31-33) or characteristic (40 CFR 261.20-24) hazardous waste under RCRA.These are part of the proposed action along with the MSUP

ADDITIONAL PERMITTING REQUIREMENTS

MASTER SURFACE USE PLAN OF OPERATIONS

The **Project-Wide Mitigation Measures and Procedures** in section 2.1.10 of Chapter 2 are considered as part of the MSUP.

Existing Roads:

1. Anadarko shell have permission the use (cross) the private land involved in this project.

Access Roads to be Constructed and Reconstructed:

1. The road(s) shall be surveyed and staked with stations set continuously along the centerline at maximum 100-foot intervals (less where needed to be visible) and at all tangent and curve control points, fence or utility crossings, and culverts

2. Prior to moving the drilling equipment onto the well pad the access road shall be thoroughly compacted, completed to an appropriate grade, and surfaced to the degree necessary to support heavy vehicular traffic during all drilling operations. This may include at a minimum the thorough compaction of the road's sub-base to at least 85% of its maximum dry density, prior to surfacing with a minimum of a four (4) inch layer of compacted gravel. The existing road(s) as well as the newly constructed road(s) may require additional compaction and surfacing to ensure the roads will stand up to the heavy equipment used during the drilling of the well.

Location of Existing and/or Proposed Facilities

1. The Standard Environmental Color selected for all above-ground structures, production equipment, tanks, transformers, insulators, not subject to safety requirements is Shale Green (5Y 4/2).

Plans for Reclamation of the Surface:

Seed Mix for Reclamation

The following shell be added to the seed mix:

Thickspike wheatgrass (*Elymus dasystachyum*) @ 2 lbs./Acre
Bluebunch wheatgrass (*Elymus spicatum*) 2 lbs./Acre

Slender wheatgrass (*Elymus dasystachyum*) @ 2 lbs./Acre may also be added.

Indian Ricegrass may be reduced to 2 lbs./Acre

Green Needlegrass and Winterfat may be dropped from the seed mix.

Other Information:

1. Construction, drilling and other activities potentially disruptive to strutting and nesting Greater Sage grouse are prohibited during the period of March 1 to June 30 for the protection of Greater Sage grouse nesting areas. This applies to all wells, pipelines or other facilities associated with the Jolly Roger Pod.

2. Construction, drilling and other activities potentially disruptive to nesting raptors are prohibited during the period of February 1 to July 31 for the protection of raptor nesting areas.

Appendix B
Master Drilling Plan

Appendix B

MASTER DRILLING PLAN (MDP)
JOLLY ROGER UNIT ALPHA POD PLAN OF DEVELOPMENT (POD)

OPERATORS (The Companies):
Warren E & P, INC. (Warren)
Anadarko E&P Company (Anadarko)

Drilling Plan for the subject wells listed below:

CBM Wells in Section 32 (WYW-148977)

1. AR Federal 1990-SE 32
2. AR Federal 1990-SW 32

CBM Wells in Section 4 (WYW-148973)

1. AR Federal 1890-NW 4
2. AR Federal 1890 – SW 4

CBM Wells in Section 6 (WYW-148973)

1. AR Federal 1890-NE 6
2. AR Federal 1890-SE 6

CBM Wells in Section 8 (WYW-129066)

1. AR Federal 1890-NE 8
2. AR Federal 1890-SW 8
3. AR Federal 1890-SE 8

CBM Wells in Section 18 (WYW-129066)

1. AR Federal 1890-NE 18

1. ESTIMATED TOPS OF IMPORTANT GEOLOGIC MARKERS

Formation	Depth
Lewis Shale	Surface
Isolated Sands in Lewis Shale	1,460' – 4,870'
	1,952' – 5,360'
Almond	2,212' – 5,620'
Pine Ridge	2,492' – 5,900'
Allen Ridge	2,710' – 6,400'
TD (CBM Wells)	7,670' – 8,460'
Cherokee/Deep Creek Sandstones	

2. ESTIMATED DEPTH OF ANTICIPATED WATER, OIL, GAS OR MINERAL FORMATIONS

Almond	Methane gas
Pine Ridge	Methane gas
Allen Ridge	Methane gas

The Lewis Shale is not anticipated to contain any zones capable of producing water. There are several zones within the Mesaverde Group capable of producing fresh water, including the coal seams. The Companies propose to test the productive formations between 1,952' and 5900'. Several coal seams may be tested for gas production to total depth. All shallow water zones will be protected with casing and cement. Cement will be brought above the base of the Lewis Shale to isolate all formations in the Mesaverde Group.

Planned Objective for CBM Wells: Mesaverde

3. MINIMUM BLOW OUT PREVENTOR (BOP) REQUIREMENTS (refer to attached schematics)

1. The BOPE will conform to Onshore Shore Order #2. The blowout preventer equipment will consist of 2000 psi W.P. Double Ram, Hydraulic Preventer is enclosed. All fill and kill lines will be 2000 psi W.P. The producing CBM wells in this area have shut-in surface pressures ranging from 180 to 600 psi after the coal has been dewatered. Therefore we are planning on testing the BOP's to 1000 psi. There will be no pressure control (BOP's) for the surface hole section from 0 to 640' MD. (See Attached Schematic).

   .

2, The BOP shall be pressure tested when initially installed, whenever any seal subject to pressure testing is broken, after repairs, or every 30 days.

3. The Companies shall notify the Rawlins BLM office 24 hours prior to the BOP test.

4. SUPPLEMENTAL INFORMATION

The primary objective of this project is to drill, stimulate, and produce methane gas from coal seams in recognized gas-producing formations of the Mesaverde Group. The coal seams are overpressured and are very unlikely to be in communication with overlying layers. Produced water will be injected in one of two deep injection wells completed in the Cherokee/Deep Creek Sandstones or in one of four shallow wells that would recharge sand units in the Lewis Shale. One of the deep injection wells and two of the shallow wells that are proposed would be federal wells.

The deep injection zone in the Cherokee/Deep Creek Sandstones is isolated above and below by competent shale barriers. Maximum pressure requirements for the injection zone would be established through injectivity tests that would identify fracture pressure limits to prevent the overlying shale from being breached by the initiation and propagation of fractures through overlying strata to any zones of fresh water. Injection horizons will not be exceeded based on injectivity tests and applicable permit limits, as regulated by the State of Wyoming and BLM. The minimum injection rate for each deep injection well is projected to be 5,000 bbls per day, and the maximum rate is projected to be 20,000 bbls per day. These deep sands are limited reservoirs and it may be necessary to find deeper reservoirs if they become filled to capacity. There are a number of deeper reservoirs that could be utilized.

The isolation of the shallow injection zone within the Lewis Shale is not as complete as the deep injection zone. In addition, it is highly unlikely that large quantities of water can be disposed of in these sands, since these sands that occur parallel to the outcrop appear to have little or no connection to a deep and extensive aquifer. Disposal of produced water in shallow wells would be monitored along the outcrop of the Lewis Shale, downdip (down structure) from disposal wells, to verify that produced water is not transferred laterally and, subsequently, does not resurface along the outcrop and compromise groundwater or surface water (increasing the salt load). Inventory and monitoring also would verify that disposal wells do not conduct water to surface springs or seeps. Shallow injection of produced water would cease if lateral transport of produced water were detected.

The proposed injection wells that would be located on BLM surface ownership lands are listed in the MDP to provide a comprehensive listing of the federal wells included in the POD for the Jolly Roger Unit Alpha area. The Wyoming Department of Environmental Quality (WDEQ) would permit these wells.

The coal seams will be perforated and stimulated by hydraulic enhancement or fracturing during testing. Fresh water, gelled water, and/or foam fracturing techniques will be used.

The following schematics that show typical facilities, operating standards, and methodologies, are attached to this MDP: B.O.P.; Bottom Flange; Configuration Options; Completed CBM Well; and Injection Well. Additional schematics for this POD are attached to the Master Surface Use Program (MSUP): CBM Drill Site Layout; CBM Well Site; Water Disposal Facility; Water Transfer Facility; and Compressor Station.

5. CASING PROGRAM

Hole Size	Casing Size	Casing Wt.	Grade	Joint	Depth Set	New/Used	Rng
12 1/4"	9 5/8"	32.3#	H-40	ST&C	**10% of well depth**	New	3
9 7/8"	7"	23#	MC-50	LT&C	0-TD	New	3

Surface Casing:	10 ¾"	32.3 ppf.	H-40	STC	Collapse	Burst	Tension
				Ratings:	1370	2270	2254M

A. Burst= [0.052 * FG * TVD (shoe)] – [Gas Gradient * TVD]
= [0.052 * 9.3ppg * 640'] – [0.1psi/ft * 640']
= 246 psi
Safety Factor = Rating/Burst
= 2270/246
= 9.23

B. Collapse = 0.052 * MW * TVD (shoe)
= 0.052 * 8.8ppg * 640'
= 293 psi
Safety Factor = Rating/Collapse
= 1370/293
= 4.68

C. Tension = Weight * MD * [1 – (MW/65.5ppg)]
= 32.3ppf * 640' * [1 – (8.8ppg/65.5ppg)]
= 17895 lbs.
Safety Factor = Rating/Tension
= 254,000/17895
= 14.2

Surface casing shall have centralizers on the bottom 3 joints of the casing, starting with the shoe joint.

Production Casing:	7”	23 ppf.	MC-50	STC **Ratings:**	Collapse 3110	Burst 3960	Tension 273M

A. Burst = [0.052 * 8.4ppg * 6400’] – [0.2psi/ft * 6400’]
= 1515 psi **
Safety Factor = Rating/Burst
= 3960/1515
= 2.61

B. Collapse = 0.052 * 8.4 ppg * 6400’ –(.1 psi/ft *6400’)
= 2155psi
Safety Factor = Rating/Collapse
= 3110/2155
= 1.44

C. Tension = 23lbs./ft * 6400’ * [1 – (10ppg/65.5ppg)]
= 23lbs./ft * 6400’ * .8473
= 124,723 lbs.
Safety Factor = Rating/Tension
= 273,000/124,723
= 2.19

** Our actual shut in tubing pressures in the Atlantic Rim area range from 180 to 600 psi.

6. MUD PROGRAM

Drilling mud will be used as the circulation medium. A fresh water, polymer, gel drilling mud will be used and visual monitoring will be done from spud to total depth. The anticipated mud weight will be between 8.5 – 10 ppg . Sufficient quantities of lost circulation material and barite will be available at the well site at all times for the purpose of assuring well control.

7. CEMENTING PROGRAM

The following is the proposed procedure for cementing the 9 5/8” surface pipe and 7” long string:

Surface Casing:

Lead: Class “C” Type III, 14.4 ppg., yield 1.44ft^3/sk @ 101% excess. Compressive strength in 24 hours at 80^oF 3100psi.

The surface casing shall be cemented back to surface. In the event cement does not circulate to surface or fall back of the cement column occurs, remedial cementing shall be done to cement the casing back to surface.

Long String:

Lead: Class "C" Type III, 14.4 ppg., yield 1.44ft^3/sk @ 35% excess. Compressive strength in 24 hours at 95^{o}F 3200psi.

Cementing plan is to bring cement back to surface. In the event cement is not circulated to surface, a temperature log will be run to indicate the cement top and this will be communicated back to the BLM. If the cement top is inside the surface casing no remedial cement work will be performed.

8. LOGGING PROGRAM

Cores: Rotary Cores will be taken as needed to evaluate the coal seams.

DSTs: None Planned

Logs: Induction, GR, SP, Density, Neutron and Caliper – From surface to TD
Cement Bond Log – From 10 ¾"casing shoe to TD
Mud Logger – As Needed.

9. PRESSURE DATA AND POTENTIAL HAZARDS

Bottom hole pressures anticipated @ 1180 – 2800 psi.
There is no history of hydrogen sulfide gas in the area and none is anticipated.

10. ANTICIPATED STARTING DATES AND NOTIFICATION OF OPERATIONS

A. Anticipated Starting Dates:

Anticipated Commencement Date - Fall 2004, or upon approval

Drilling	- Approximately 7 days per well
Completion	- Approximately 2 days per well
Initial Testing	- Approximately 7-14 days per well
Production Testing	- Approximately 6-12 months per well

Note: Drilling operations will commence as soon as practical after approval of all necessary permits including the Applications for Permits to Drill (APDs).

B. Notification of Operations:

Rawlins Field Office, BLM
1300 North Third
Rawlins, Wyoming 82301
(307) 328-4200